ANCIENT INDIA

Bulletin of the Archaeological Survey of India



NUMBERS 20 & 21
1964 & 1965

CONTENTS

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NOTES

IN 1965, THE GOVERNMENT OF INDIA APPOINTED AN ARCHAEOLOGY REVIEW COMMITTEE, with the distinguished Sir Mortimer Wheeler as chairman and Professors Niharranjan Ray, H. D. Sankalia and S. Nurul Hasan, all well-known in the field, as members, to (i) assess the work of the Archaeological Survey of India, (ii) make recommendations about the lines on which the Survey should plan its work for the next five years and assess its requirements in terms of personnel and finance, and (iii) make suggestions for closer cooperation with the State Departments of Archaeology and the Universities. This was to be the second review of its kind, the first having been made by Sir Leonard Woolley in 1938, with a more limited objective. During the intervening period Indian archaeology had taken enormous strides—in organization, in knowledge and in technique; the second review was therefore as timely as it was significant.

The Committee assembled from the 15th March to the 1st April, 1965, during which period it met for more than sixty hours in New Delhi, saw the Survey's excavation at Kalibangan in Rajasthan, inspected the Survey's South-eastern Circle and the State Department of Archaeology at Hyderabad, and the Survey's site-museum at Kondapur in Andhra Pradesh and Northern Circle and Gardens Branch at Agra. With commendable promptitude it submitted its 22,000-word Report, divided into twenty chapters and with two appendices, to the Minister of Education on the 2nd April.

* * * * * *

A few extracts from the Committee's Report will illustrate the appreciative spirit with which it set about and performed its work :

> 'The Committee wishes to make one thing clear at the outset : namely, its complete faith in the integrity, liveliness and devotion of the Survey's staff. A member of the Committee has more than once said and written publicly, outside India, that in his experience the Survey is on the whole the most efficient, as it is certainly the most comprehensive, in the world. And India gets good value for its expenditure on its archaeology. Tours from abroad are now being organized (at considerable cost) for the specific purpose of enabling tourists from the west to see something of India's famous historic sites and monuments. More important, the achievements of the Survey in methodical excavation and other aspects of archaeology, including epigraphy, are steadily widening the reputation of Indian archaeologists amongst their fellow-scientists abroad.'

'It is fair to say that in no part of the world is there at the present time a better understanding than in India of the basic techniques of modern scientific excavation. It is equally fair to say that only constant enterprise and effort can sustain this high position.'

'The Survey remains, and will remain, the only institution capable of sustained and major enterprises of the kind [in the field of excavation]. The Survey is responsible for sustaining the national standard in this increasingly scientific branch of research, and it must be fully equipped to lead, not only in India, but in a very competitive international field where all the principal countries in the world are today actively engaged.'

'Thanks to the Survey, archaeological exploration and excavation have given India a high and growing status in the effort, shared today by all civilized countries, to discover more about ourselves as culturally creative human beings.'

It is also fair to note that the Report has also pointed out a few deficiencies in the Survey : for example, the lack of a full-fledged Science Laboratory to aid archaeology; failure in the prompt publication of some excavation-reports; inadequate publicity; poor pay-scales of the technical grades of the Survey; and unequal distribution of the number of monuments among the Circles. Hardly any of these shortcomings were unknown to the Survey; in fact, most of them, including suggestions on their remedies, were brought to the notice of the Committee by the officers of the Survey itself in the course of their 'evidences' before the Committee. And the Survey is glad that the Committee has recognized them and made recommendations to overcome them.

* * * * * *

The following, in brief, are the main recommendations of the Committee:

1. Creation of a new Circle and redistribution of the jurisdiction of some of the existing ones of the Survey; reconstitution of the Circle for Delhi monuments.

2. Removal of extraneous activities from the functions of Circle officers of the Survey by relieving them of duties of excavation and exploration and lightening their administrative burden by giving each Circle an administrative officer; taking of special steps to attract qualified engineers for the preservation of monuments.

3. Centralization of the village-to-village survey of antiquarian remains already undertaken by the Survey.

4. Creation of a second Excavations Branch within the Survey.

5. Initiation by the Survey of studies in medieval architecture; excavation of Fatehpur-Sikri, a medieval capital with a short but well-dated life; survey of fast-disappearing domestic buildings.

6. Complete freedom to the Survey in the choice of, and dealings with, its printers; constitution of a Publications Branch in the Survey.

7. Establishment of a Science Laboratory within the Survey for the study of building-materials and techniques in relation to processes of time and weather and of conservation of organic materials, for metallurgical and ceramic investigations and for geochronological and archaeometric research, with a zoologist and a physical anthropologist on its staff.

8. Widening of the scope of the Survey's School of Archaeology; holding of annual training-courses in conservation.

9. Establishment of Indian Schools of Archaeology in appropriate countries.

10. Close cooperation between the Survey and the Universities in the choice of problems and in the insurance of sound standards in the field and in prompt reporting.

11. Watching of development of archaeological pursuits in the States, which, with exceptions, have not taken up archaeology in a scientific spirit.

12. Centralized control over the Branch and Circle libraries of the Survey.

13. Adjustments in the Museums and Gardens Branches in the Survey.

14. Shifting of a few offices of the Survey to more convenient centres and better housing of all its offices.

15. Setting up of a documentation-centre in the Central Archaeological Library with the material collected by the Archaeological Atlas unit.

16. Provision of better pay-scales and avenues of promotion for the technical grades and abolition of grades with utterly inadequate pay-scales in the Survey.

* * * * * *

It is not possible here either to do justice to all the aspects of the Report or to comment on all the points raised therein, vital as they are for the development of archaeology in the country. It may only be recorded here that the Survey, to which the Report mostly relates, deeply appreciates it and thanks the Committee for it.

The implementation of most of the recommendations of the Committee requires money, which is tight. Nonetheless, the lines of progress have been laid down and will be followed, with modifications and adjustments where necessary, as soon as the situation permits.

* * * * * *

We are regretfully conscious of the fact that the publication of *Ancient India* is behind schedule, but an enumeration of our difficulties will only weary the reader. Furthermore, with the cost of production soaring high, we shall be constrained to increase the price and subscription-rates. Our only consolation is that in spite of heavy odds we held the price-line for a long time—a credit which few publishers in the country can claim.

A. GHOSH


PRINCIPAL CHALCOLITHIC SITES
MENTIONED IN THE REPORT
GILUND
AHAR
MANDASOR
ERAN
NAGDA
AHMADABAD
BHOPAL
LOTHAL
RAJKOT
RANGPUR
MAHESHWAR
NAVDATOLI
MEHGAM
BHAGATRAV
PRAKASH
PRABHAS-PATAN
ARABIAN SEA
DHULIA
BAHAL
TEKWADA
NAGPUR
NASIK
JORWE
DAIMABAD
NEVASA
BOMBAY
CHANDOLI
POONA
KILOMETRES
MILES
ROCKS
AREA OF MAP
SOILS
PLEISTOCENE & RECENT
TERTIARY
DECCAN TRAP
CUDDAPAH & VINDHYAN
DHARWARIAN
GRANITES & GNEISSES

FIG. 1

PRAKASH 1955: A CHALCOLITHIC SITE IN THE TAPTI VALLEY

By B. K. Thapar

WITH CONTRIBUTIONS BY DR. V. T. ATHAVALE, K. RAMESH RAO & R. SHAHI

CONTENTS

1. INTRODUCTORY

A. The general problem and objectives of the work

In the early twenties of the present century, the discovery of the Indus Civilization pushed back, albeit across a chronological gulf, the story of civilization in India into the third millennium B.C. and thus posed problems for a connected history of the 'lost' thousand years. Subsequent explorations in the next decade or so extended the reach of this civilization as far north-east as Kotla Nihang Khan (Rupar) in the foot-hills of the Siwaliks and as far south as Rangpur on the coastal flats at the neck of the Kathiawar peninsula.[1] But, the gap separating the Indus Civilization from the cultures of the early historical period continued to be sharply defined. Thus, in western India almost nothing was known about the protohistoric period up to the time of the Aśokan inscriptions set up about the middle of the third century B.C. This Blank Millennium remained a standing challenge to Indian research till as late as 1950, when excavation at Nasik on the Godavari and Jorwe[2] on the Pravara brought to light, in a stratified sequence, a chalcolithic culture characterized by the use of a black-painted red ware, blades and microliths and, to a restricted degree, copper or low-grade bronze. This provided perhaps the first pier for bridging the yawning gulf. In the wake of this discovery, further work in 1952-53 at Maheshwar and Navdatoli[3] on the Narmada

[1] *Ancient India*, no. 3 (1947), p. 58, fig. 1.

[2] H. D. Sankalia and S. B. Deo, *Report on the Excavations at Nasik and Jorwe, 1950-51* (Poona, 1955).

[3] H. D. Sankalia, B. Subbarao and S. B. Deo, *The Excavations at Maheshwar and Navdatoli, 1952-53* (Poona, 1958).

revealed a variant chalcolithic culture interlocked with that encountered earlier at Nasik and Jorwe. In the following year, a renewed excavation at Rangpur[1] produced a four-fold sequence (discounting a prior microlithic occupation) of a continuously developing chalcolithic culture of which the lowest phase was the Indus. The uppermost phase, being transmuted from the Indus or Sub-Indus, was distinguished by a typical ceramic, christened the Lustrous Red Ware. This Ware had also been found at Maheshwar and Navdatoli along with the easily-recognizable elements of the Nasik-Jorwe Ware. Here, therefore, was an evidence for linking up the Indus Civilization with the chalcolithic cultures of central India and the northern Deccan. The evidence for filling or narrowing down the gap added up. For a proper assessment of this presumptive interrelationship, an excavation of a site in the Tapti valley was a desideratum. Surface-explorations had indicated such a site at Prakash, on the confluence of the Tapti and the Gomai. Accordingly, an excavation, essentially of a restricted extent, was undertaken at this site during the months of February-April 1955.[2] Within these limits, of time and resources, the work fulfilled the objective inasmuch as within the chalcolithic occupation two phases, represented respectively by the Maheshwar-Navdatoli and the Nasik-Jorwe elements, were identified in a stratified sequence.[3] Of these, the Nasik-Jorwe element was intrusive and also contained an additional strain of the Lustrous Red Ware, rendered familiar by the work at Rangpur. In retrospect, it may be averred that the simultaneous work by the Deccan College Post-graduate and Research Institute and the Rajasthan Archaeological Department, respectively at Nevasa[4] on the Pravara, a tributary of the Godavari, and Ahar[5] on a rivulet of the same name, a feeder of the Banas, provided the necessary perspective to this evidence.

B. Acknowledgements

The excavation described here was carried out by the South-western Circle of the Archaeological Survey of India under my direction. Throughout the work, I was assisted by Shri M. K. Dhavalikar, then Technical Assistant in the Circle, and my wife, who, besides helping me on the field, also recorded and classified the finds. Grateful mention may also be made of Shri V. B. Mathadhikari and Shri S. P. Mote, who formed the rest of the willing team. To the preparation of the illustrations accompanying the report many hands have contributed. The photographs of the site were taken entirely by Shri M. B. Limaye, while those relating to pottery and other finds were produced by Shri M. B. Limaye and Shri M. U. Qureshi, Photographers respectively of the Excavations and Prehistory Branches of the Survey. The map (fig.1) and the section drawing (pl.V) including the chart of comparative chronology (fig. 2) have been drawn respectively by Shri A. K. Roy, Surveyor, and Shri L. K. Jain, Draftsman, of the Excavations Branch. The drawings of the pottery and stone and metal objects have been prepared variously by Shri S. S. Sar of the Frontier Circle, Shri A. K. Patankar of the Central Circle and Shri S. K. Mukherjee and Shri S. K. Jagtap of the Excavations Branch; those of beads by

[1] S. R. Rao, 'Excavation at Rangpur and other explorations in Gujarat', *Ancient India*, nos. 18 and 19 (1962 and 1963), pp. 4-207.

[2] *Indian Archaeology 1954-55—A Review* (1955), pp. 1 and 13, pls. XVIII-XXII.

[3] A. Ghosh in *Ancient India*, no. 12 (1956), p. 2, and B. Subbarao, *Personality of India* (first edition, Baroda, 1956), p. 48.

[4] *Indian Archaeology 1954-55*, pp. 1 and 5-8. Also H. D. Sankalia, S. B. Deo, Z. D. Ansari and Sophie Ehrhardt, *From History to Prehistory at Nevasa (1954-56)* (Poona, 1960).

[5] *Indian Archaeology 1954-55*, pp. 2 and 14-15.

Shri Amir Singh of the Director General's Office and those of the blades and microliths, as also the design-elements of the painted pottery of Period I and the distribution map of the Northern Black Polished Ware by Shri L. K. Jain. The coins have been identified by Dr. D. C. Sircar, then Government Epigraphist. To all these persons and to those who were associated with the work either during the excavation or in the completion of the report, in particular to Shri R. V. Chalam, Stenographer, I am deeply beholden. I am also indebted to Dr. V. T. Athavale, Head of the Analytical Division, Atomic Energy Establishment, Bombay, for the chemical analysis and metallographic examination of some of the illustrated copper and iron objects, and to Shri K. Ramesh Rao and Shri R. Shahi of the Wood Anatomy Branch, Forest Research Institute, Dehra Dun, for the examination of the charcoal samples.

2. THE SITE AND ITS ENVIRONS

Fig. 1; pls. I-IV

Prakash, popularly known as Prakasha[1] (21° 30′ 30″ N. Lat. and 74° 21′ 30″ E. Long.), lies in Shahada Taluk of Dhulia District, formerly in Bombay Province and now included in Maharashtra State. Situated on the confluence of the rivers Tapti and Gomai and enclosed within the sharp meander of the latter, it can be reached by road either from Nandurbar or from Dondaiche, both railway-stations on the Bhusawal-Surat section of the Western Railway. While on the former route (about 12 miles), State Transport buses reach up to Korat, a village (also an ancient site) opposite Prakash on the southern bank of the Tapti river, which can be crossed by ferry operating in fair weather, on the latter (about 25 miles), buses come right up to Prakash *via* Shahada.

The ancient site is located to the south-east of the present village (pl. I) and measures nearly 1,400 ft.[2] in length and 600 ft. in width; the longer axis, in north-south orientation, runs along the Gomai river and shows a vertical eminence, doubtlessly eroded by the river (pl. II). This immense man-made mound, rising 70 ft. or more above the surrounding level and scarred by gully-erosions and riven sides (pl. IV) dominates the landscape for miles around. The northern half of the mound, locally known as Bhilwada, is occupied by the Bhils, while the southern half is a *gaothān* but was, until recently, used partly as a burial-ground by the Muslims.

Silhouetted against the southern margin of the mound and overlooking the confluence, is the Saṅgameśvara-Mahādeva temple (pl. III). About a mile further west of the village and along the northern bank of the Tapti river is a group of memorials or *chhatrīs* including two temples, known as Kedāreśvara and Kāśi-Viśveśvara. All these temples are comparatively recent, having been built in the earlier half of the eighteenth century.[3]

[1] *Gazetteer of the Bombay Presidency*, XII, Khandesh (1880), p. 466, and *Imperial Gazetteer of India*, XX (Oxford, 1908), p. 216.

[2] As at the time of the excavation (1955) the metric scale had not been adopted in India, the trench was laid out and other measurements in the field taken according to the English scale, which also figures on the plates. The former has, however, been used in giving measurements of small finds.

[3] Five inscriptions, three from the Saṅgameśvara-Mahādeva and one each from a *minār* opposite the Kedāreśvara and the Kāśi-Viśveśvara temples, and dated respectively to 1667, 1653 and 1664 of the Śaka era, refer to the building of these temples by some people of the Kadam family. Cf. B. R. Kulkarni, 'Prakāśen devaļāntil śilālekh', *Saṁśodhak*, 7, nos. 1 and 2 (1938), pp. 230-31. Another damaged inscription on a slab, now fixed on the brim of a well, records the construction of a temple for Vikramārka by the two Brāhmaṇa brothers named Haradeva and Mahādeva in 1156 of the Śaka era. *An. Rep. Ind. Epigraphy for 1954-55* (1957), p. 34, B-89.



Prakash: general view, looking north; A, the present village; B, the encamping area and C, the excavation-site. In the foreground is the river Tapti. *See p. 8*



Prakash: general view of the mound with the river Gomai in the foreground. *See p. 8*

To face pl. III



Prakash: general view of the mound, looking north-east, showing the Saṅgameśvara Mahādeva temple in middle distance. *See p. 8*



Prakash: close view of the rain gully, looking north. The figure with a ladder in the upper right distance indicates the location of the excavated cutting. *See pp.* 8 and *10*

To face p. 9

East of the village, in the shadow of the mound and almost on the right bank of the Gomai river, stands yet another temple called the Gautameśvara, said to have been built by one of the Holkars. The place is regarded as sacred by the Hindus and every twelfth year, on the occasion of the *simhastha*, a great fair is held here.

Geologically, the area falls within the lavas of the Deccan trap and shows a varied landscape due to differential erosion of its component.[1] Trap forms the hills and is occasionally seen in the bed of the Tapti as also in deeper ravines. Two types of lava-flows can be distinguished in this tract: (i) well-jointed dark and non-vesicular trap which breaks with a conchoidal fracture and (ii) highly vesicular fragile pink- or purple-coloured rock. The latter abounds in secondary minerals like zeolite, chalcedony, agate, jasper and crystalline aggregates of quartz, which are normally used for the manufacture of lithic tools. The inter-trappean beds also contain cherty and limestone nodules.[2] Such deposits have, however, been not noticed in the immediate vicinity of Prakash but are recorded in the upper Tapti valley. It is quite likely that subsequent to their erosion, the secondary minerals may have been transported by numerous nullahs and discharged into the main river. The raw material used for the lithic industry of the earliest settlers at Prakash was thus ready to hand.

Another noteworthy geological formation of the area is the older alluvium of which considerable deposits have been recorded in the Narmada and Tapti troughs or rifts.[3] This alluvium consists of calcareous tufa, sands and pebbly gravels. The ancient gravels which contain a large quantity of secondary minerals yield at places Middle Stone Age tools (formerly termed as Series II tools).[4]

As regards soils, the region with which we are concerned is largely covered by *regur* or 'black cotton soil', highly retentive of moisture, and brown under deciduous forest, slightly or not leached. The latter soil was duly recognized as the natural soil exposed below the occupation-strata in the excavation. For present-day cultivation, such soils are pre-eminently suited for cotton and *jowār*. Along the banks of the river where the land is cut by deep ravines, the soil is mixed or overlaid with lime-nodules; at places the surface-soil is completely washed away leaving strips of rich alluvium *in situ*.

Geographically, the Tapti valley is 'a transitional zone between central India and the Deccan' or 'the vestibule of the Deccan from the north'.[5] Culturally, this is amply borne out by the archaeological explorations and excavations undertaken in the area, wherein elements both of the Deccan and the central Indian cultures are met with. Furthermore, not very far from the estuary of the Tapti river, some elements of the

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[1] A detailed mapping of the flows has not so far been attempted and the information given here is based on the traverses recently made in this area by Dr. R. V. Joshi, Superintendent, Prehistory Branch of the Survey. Also cf. L. Leigh Fermor, 'On the basaltic lavas penetrated by the deep boring for coal at Bhusawal, Bombay Presidency', *Rec. Geological Surv. Ind.*, LVIII, pt. 2 (1925), pp. 93-240.

[2] W. T. Blanford, 'Traps and inter-trappean beds of western and central India', *Mem. Geological Surv. Ind.*, VI, pts. I and II (1867), pp. 137-62.

[3] O.H.K. Spate, *India and Pakistan, a General and Regional Geography* (London, 1960), pp. 9, 10 and 593-94. The alluvium beds occurring in the Narmada basin are proved, on fossil evidence, to be of Pleistocene and Sub-Recent period. Since there is evidence that at one time the Tapti was in confluence with the Narmada river, the older alluvia of both these rivers belong to the same geological period. Cf. E. Vrendenburg, 'Pleistocene movement as indicated by irregularities of gradient of the Narbada and other rivers in the Indian peninsula', *Rec. Geological Surv. Ind.*, no. 33 (1906), p. 43.

[4] *Indian Archaeology 1958-59—A Review* (1959), p. 22, fig. 11.

[5] Spate, *op. cit.*, pp. 593-95.

Harappa Culture have also been identified.[1] Archaeologically, the area is, therefore, of potential importance. Surface-explorations in Dhulia District including a stretch of the Tapti valley have brought to light sites and localities ranging from the Early Stone Age through the chalcolithic to the historical period.[2]

3. CULTURE-SEQUENCE AND MAIN CHARACTERISTICS OF DIFFERENT PERIODS

Pls. V-VIII

The main objective of the present excavation was to ascertain the succession of cultures at the site and to produce a relative time-scale for the region. For this formidable purpose a restricted area, represented by a single cutting (PRK-1),[3] was trenched in a rain-gully (pl. IV) and dug *vertically* down to the natural soil. This choice ensured a complete section of the mound. The excavation exposed a 56- to 57-ft. deep occupational deposit of orderly stratification relating to four cultural Periods (numbered I to IV from bottom upwards), with a definite break between the first two (pls. V and VII-X) and a continuous sequence thereafter. The main characteristics of each Period are outlined below beginning with the earliest.

A. Period I

Period I, extending to an average height of 13 ft. 6 in. above the natural soil, was chalcolithic in cultural content and was further divided into Sub-periods I A and I B. The former was characterized by the occurrence of blades and microliths,[4] hammerstones, a restricted use of copper or low-grade bronze and the currency of four ceramic industries, each distinct in kind or range. Of these, the blade and microlithic industry, being the principal component of the chalcolithic culture, was dominated by a blade-complex. The parallel-sided flakes or plain blades, utilized as struck without any retouching, formed an overwhelming majority. Amongst the tools showing secondary working, the blade-class, namely the serrated blades, blunted-black blades and pen-knife blades, constituted the larger percentage, the next in order of frequency being points, lunates and trapezes. The secondary retouching, wherever present, was of a steep blunting nature. The occurrence in this *milieu* of spheroid balls (pl. XXI), both of the circular and discoid variety and showing flattened and occasionally battered sides, responds consistently with their hypothetical use as hammerstones (below, p. 107).

The use of metal, being the justification of the appellation 'chalcolithic', was attested by the find of one solitary shapeless bit of copper (unillustrated). Evidently, during this Period copper was still considered a very precious and prized metal and was not universally adopted.

Among the miscellany of less abundant finds were: beads, variously of carnelian, shell and paste, including a distinctive spacer (fig. 38, *32*; pl. XXII, *32*) and a chisel-ended

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[1] *Indian Archaeology 1957-58—A Review* (1958), pp. 13-15.

[2] *Indian Archaeology 1958-59*, pp. 22-24, *ibid., 1959-60* (1960), pp. 33 and 34 and *ibid., 1960-61*, (1961), p. 26; also S.A. Sali, 'An outline of archaeological evidence from Dhulia District', *Saṁśodhak*, 29 (1960), pp. 104-113a.

[3] 'PRK' is the abbreviated form adopted for 'Prakash'.

[4] For definition see below, pp. 93-94.

tooth pick or pendant (fig. 38, *33*; pl. XXII, *33*); fragments of shell bangles (pl. XXIV, *22*); curious terracotta 'hones' (pl. XXVI B, *18* and *19*); a painted terracotta toy-cart wheel (pl. XXVI A, *1*); and a painted terracotta bull (pl. XXV B, *5*).

Four ceramic industries, all employing the wheel for potting, were in use during this Sub-period.

(i) Pale-grey ware, often burnt black-and-grey and adorned with painted designs in a fugitive white pigment both on the outside and the inside, but with a marked preference for the latter (below, pp. 28-35).—On the outside (fig. 3), these consisted of obliquely-converging lines in groups of one to four, while on the inside (figs. 3 and 4), they comprised, besides the converging lines, groups of dots, dashes, comma-like strokes, herring-bones and wavy meanders. The technique of decoration employed was essentially 'surface' or 'unity' wherein the whole vase was treated as a free field for a single design or several independent designs, the cumulative result being a pleasing effect of dark and light values in a balanced pattern. The shapes represented in this ware were confined to the deep bowl, spheroid or ovoid in profile (fig. 5, *1-3*), the *loṭā*-shaped vase (fig. 5, *6*) and a vase with pronounced shoulder (fig. 5, *9*). A solitary sherd of the related white-painted black-and-red ware of the Ahar fabric (fig. 5, *10*) was also recovered from the lowest levels, and thus provided a useful clue for an interrelationship.

(ii) Black-painted red pottery of the Malwa Ware (below, pp. 35-49).—This ware, almost invariably dressed with a self-slip, presented a considerable variety in designs (fig. 7), which were painted in a thin purplish to brown-black pigment. These included a medley of loops; rayed joined volutes; rows of criss-cross; hatched or latticed diamonds; triangles, pendant or upright; grouped wavy or converging lines; concentric circles; diaper; chevrons; latticed or ladder-hatched lines. Besides this poor and uninspired repertory of an essentially geometric kind, representational motifs, displaying animals and birds like spotted deer, cranes, peacocks, often stylized, were also depicted. The commonest shapes represented in this ware included the vase (fig. 8, *1-17*), jar with clubbed or collared rim (fig. 9, *22-27*), bowl (fig. 8, *18* and *21*), dish (fig. 9, *28, 29, 31* and *32*) and dish-on-stand (fig. 9, *30, 33* and *34*).

(iii) Other decorated ware showing incised and applied designs of varying complexity (below, pp. 56-61).—The ware was relatively low-fired and showed almost invariably a burnished surface in shades of mottled grey and tan colour. The decorative theme for the incised variety consisted essentially of simple designs like oblique or vertical slashes, herring-bones, chevrons, criss-cross and circlets. These were executed when the paste was either plastic or leather-hard and showed no burrs or raised edges along the incised lines. Representational motifs like the tortoise (fig. 16, *20*) were included in the appliqué repertory. Of the shapes, the shallow dish, decorated on the inner side with continuous herring-bones (fig. 16, *24*), was quite distinctive and may simulate husking-trays.

(iv) Coarse burnished and other plain wares (below, pp. 61-66).—Of these, the former was easily distinguishable by its blotchy grey or drab appearance and burnished surface, heavy body and occasionally an ochreous paint on the rim portion. Common shapes met with included the dish or platter (fig. 17, *1*) and lid (fig. 17, *9-11*). Of unusual interest in the former shape was the one with looped feet (fig. 17, *2*). The plain red ware was not very distinctive, but in fabric resembled the black-painted red ware of the Malwa fabric.

Sub-period I B was distinguished by the intrusion of two more ceramic industries, viz. (i) the black-painted red pottery of the Jorwe Ware (below, pp. 49-54) and (ii) the Lustrous Red Ware (below, pp. 55-56), the other industries of the preceding Sub-period continuing throughout (below, Table I, p. 26).

(i) The black-painted red fabric of what has come to be known as the Jorwe Ware, after the name of the site where it was first encountered.—The Ware was characterized by thin well baked sections and smoothed red-slipped surface, often bearing painted designs in black pigment. The syntax of the designs, being less ambitious, was severely geometric (fig. 13) and comprised: vertical or converging lines; zigzags; wavy lines; criss-cross; and running loops forming latticed diamonds or upright triangles. Each element was panelled within horizontal bands. The decorative scheme employed a 'zonal' or 'tectonic' technique wherein the structure of the vase was emphasized. The Ware was represented in only three shapes, viz. the concave-sided carinated bowl or dish (fig. 14, *1-24*), tubular spouted vase (fig. 14, *27*) and high-necked globular vase (fig. 14, *28*).

(ii) The lustrous red ware.—It was distinguished by its glossy surface-dressing and black-painted decoration and was represented by only six sherds. Although in its patent fabric, particularly at centres of diffusion, the Ware is represented in the concave-sided bowl with or without a carinated profile, stud-handled bowl, dish and dish-on-stand and stemmed bowl, only the concave-sided bowl was encountered at Prakash. The design-elements mostly resembled those of the Jorwe Ware. Elsewhere, they include in addition portrayal of animals like the deer, bull, birds in row, etc.

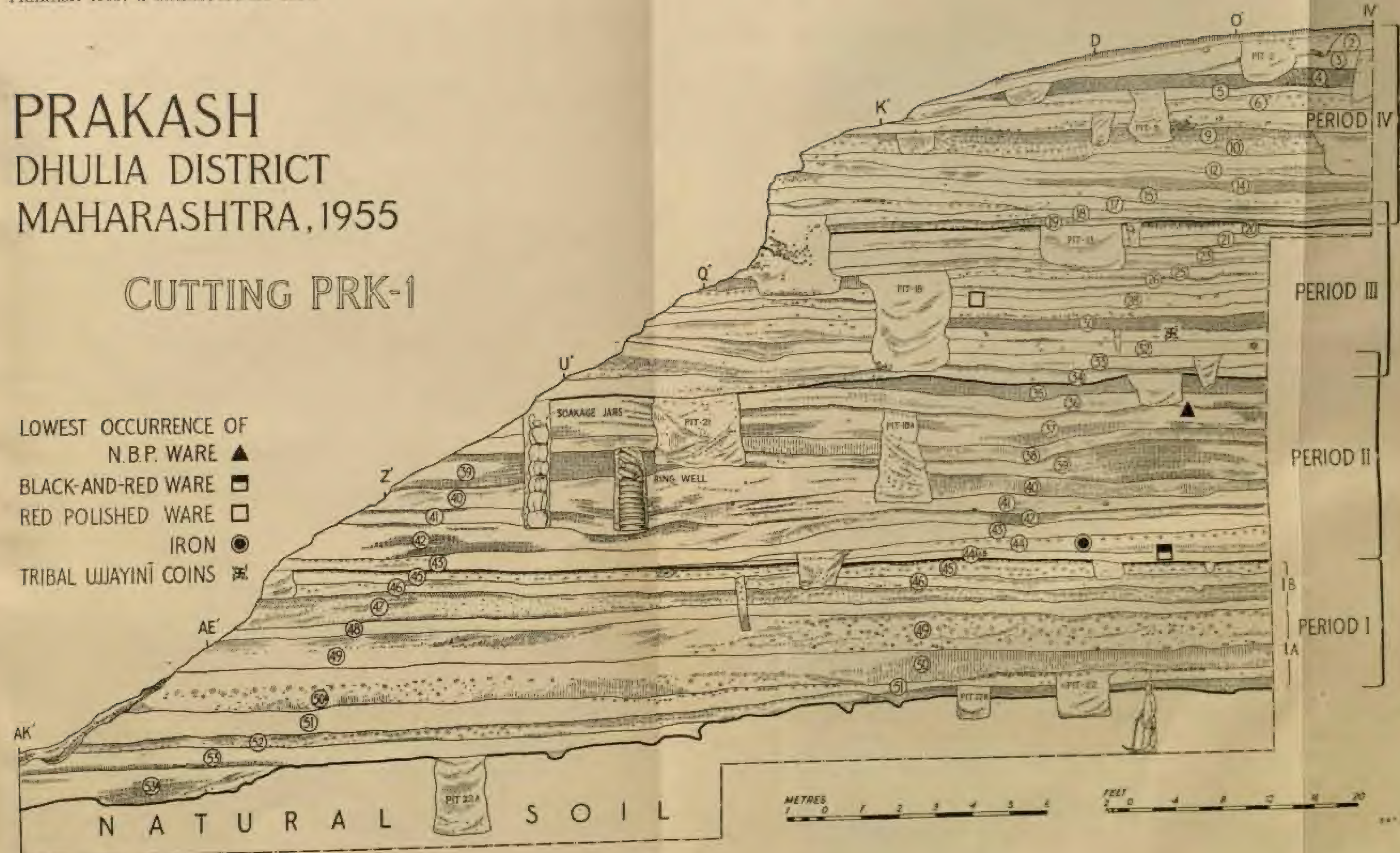
Other finds of the Sub-period included: blades and microliths, with the larger percentage of parallel-sided flakes or blades, penknife blades and points; spheroid balls or hammerstones; beads of carnelian, coral, paste and shell including a tortoise-amulet in the last-mentioned material (fig. 37, *31*; pl. XXII, *31*); and bangle-fragments of shell and bone styluses (pl. XXIX, *3*). It would be seen that amongst microliths, trapezes were absent during this Sub-period, which otherwise showed the additional use of coral as a bead-material and bone for styluses. In view of the restricted area of the dig this phenomenon, however, may not be overemphasized. No house-plans were encountered throughout the strata of Sub-periods I A and I B.

To recapitulate the evidence regarding the cultural equipment of Period I. The inhabitants were essentially farmers with crop- and stock-raising economy, though some of them might be resorting to hunting and fishing for the supply of meat. From the economic point of view, the increasing use of parallel-sided flakes and blades of various categories, forming as they do an impressive bulk in this industry, is significant as it indicates an advance not only in the technique of working stone but also in the food-habits showing a more settled economy with a semi-urban bias and efficient level of food-production. The blade proved to be the most utilitarian tool in such an economy wherein the use of metals was very restricted indeed. The inhabitants did not yet know iron, and copper or low-grade bronze was used very sparingly. For their daily requirements, they relied on stone tools like blades and microliths which they made from the nodules, abundantly found in the river-bed close by. Their differing ceramic industries, being quite distinctive and developed, while emphasizing the stable character of the economy indicated interrelationship with other sites in the region. Other industries like the production of beads, bangles and styluses equally bespeak a sedentary life with a leisure for such arts and workmanship.

B. Period II

Period II, which followed after an interval of some six centuries, heralded the Iron Age. Stone implements—blades and microliths—were suddenly replaced by tools of iron. The systematic use of iron was known right from the earliest level of the Period. Of the thirty objects recovered from this Period, no fewer than fifteen came from the early

PLATE V



To face p. 12

levels, the middle and the late levels yielding respectively nine and six. The miscellany of objects included both tools and weapons like knife-blades, ferrules, sickles, nails, clamps, arrow- and spear-heads, celt-like axe-heads, etc. The use of copper became more common, though remaining subordinate to that of iron. Of the fortythree objects obtained from the dig, as many as twentyone came from Period II, five being from the early, six from the middle and ten from the late levels. These included bangles and rings, antimony-rods and a lid, possibly of a casket. Grinding-stones or querns, along with pestles and rubbers, formed the kitchen outfit. Fortyseven beads, variously of silicon minerals like quartz, rock-crystal, carnelian, agate and jasper, coral, terracotta and bone (below, Table IV, p. 111) were recovered from this Period. Of these, a lump of twelve standard bicone hexagonal beads in rock-crystal (fig. 37, *23*; pl. XXII, *23*), five chevron or chain beads in carnelian (fig. 37, *30*; pl. XXII, *30*) and a scabbard-type pendant in terracotta (fig. 38, *41*; pl. XXIII A, *41*) are particularly noteworthy for workmanship. Amongst other finds, mention may be made of: bangle-fragments of shell (pl. XXIV, *10* and *24*) and glass (pl. XXIII B, *1*); terracotta caskets (pl. XXVI A, *6* and *7*) and the hypothetical head-scratchers (pl. XXVI A, *11*); an ivory comb (pl. XXIX, *7*); bone styluses including borer (pl. XXIX, *1* and *4*); perfume-casket (pl. XXIX, *6*); and the familiar pulley-shaped ear-ornaments (pl. XXIX, *9* and *10*). Two badly-corroded and defaced punch-marked coins, recovered from the late levels, provided evidence for the use of coinage.

Three principal ceramic industries, each marked by innovation in pottery-tradition, were current during the Period: (i) black-and-red ware (below, pp. 68-71); (ii) the Northern Black Polished Ware (below, pp. 71-75) and (iii) other plain wares (below, pp. 75-84). Of these, the first two are of special chronological importance, although for neither an initial date which is acceptable and consistent is available.

(i) THE BLACK-AND-RED WARE.—Produced as a result of inverted firing, this ware was the dominant industry of the Period in the earlier levels but consistently waned as occupation advanced. Only rudimentary shapes like the bowl, dish and small globular vase (fig. 20) were represented. Amongst these, the bowl with a multi-grooved profile (fig. 20, *2b*) was noteworthy. The ware was comparatively low-fired and often showed incompletely-oxidized sections in the core. The ware is only technically akin to the familiar megalithic Black-and-red Ware; beyond that in the present state of research it is difficult to commit. In recent years, the black-and-red ware has been found in varying cultural *milieu* at a number of sites in central India, Rajasthan and the northern plains. The problem of integrating the users of this ware remains unsolved, and the possibilities for argument and polemic are indeed many.

(ii) THE NORTHERN BLACK POLISHED WARE.—This *de luxe* ware along with certain associated forms reached the site only towards the close of the Period, possibly in the wake of the organized Mauryan expansion in *circa* third century B.C. The site is peripheral to the centres of diffusion and the Ware is unlikely to have come much earlier. Only ten sherds of this Ware were found in the cutting.

(iii) OTHER WARES.—Largely nondescript, they included a relatively low-fired blotchy red ware with a vesiculated paste and represented by the *kaṛāhī* or pan, occasionally ring-handled (fig. 23, *14*), and medium-sized vase (fig. 25, *26* and *27* and fig. 26, *42*). The soot-marks on the lower part of some of these vases indicated their use for cooking-purposes.

Although no house-plans were recovered, soak-pits, made of terracotta rings (pl. XI A) or of pierced pots (pl. XI B), were duly met with.

In summary, the cultural equipment including the economic and technological stage of development during this Period was as follows. Organized civic life and occupational

specialization began with the impact of the iron-using trait. With the introduction of the utile metal, the settlement assumed an urban character. The economic and social development no longer remained local but was influenced or inspired by other elements diffused from the more advanced civic centres of the northern plains. The system of coinage, concomitant of urbanization, came into being towards the latter part of the Period. Elements of urban sanitation like soak-pits became a recurrent feature. Personal ornaments and domestic equipment showed a similar development and sophistication. Ceramic industries, though for the most part strictly utilitarian and of little aesthetic value, showed widespread interrelationship.

C. Period III

Period III, which in its earlier levels was overlapped with Period II and in later levels with Period IV, did not introduce any revolutionary change. The characteristic ceramic industries of the preceding Period went into disuse and were replaced by a nondescript poorly-made red ware (below, pp. 84-89), essentially plain in treatment and represented by a few shapes like the widely-distributed lid (fig. 27, *1* and *2*), bowl (fig. 27, *3*), basin occasionally with pinched lip (fig. 27, *4*) and vase (fig. 27, *13* and fig. 28, *19* and *21*). The dish-form was conspicuous by its absence. From the mid-levels and upwards were also found sherds of the typical Red Polished Ware in the characteristic sprinkler-form (fig. 28, *22*) and Kshatrapa painted sherds, diversified by white and black bands on the shoulder (fig. 28, *20* and *26-28*).

Amongst metal objects, iron accounted for twentyone; copper, fourteen; and lead, two. Noteworthy iron objects included: bangle-fragments (fig. 42, *22*; pl. XXVIII B, *17*); a chopper (fig. 42, *28*; pl. XXVIII B, *15*); a shaft-hole axe (fig. 43, *30*); a bobbin-like object (fig. 43, *31*; pl. XXVIII B, *19*); and a punch (fig. 42, *20*; pl. XXVIII B, *12*). Copper objects included: antimony-rods (fig. 39, *2*); two bells (fig. 39, *8* and *9*; pl. XXVII A *8* and *7*); a pin (fig. 39, *4*; pl. XXVII A, *1*); and a fragmentary bangle (fig. 39, *5*; pl. XXVII A, *6*). The two lead objects (fig. 44, *1* and *2*, pl. XXVII B, *1* and *2*) represented spools for distending ear-lobes.

The quern-stones of this Period belonged to a widely-distributed variety wherein the legs were well-cut and one of the ends projected beyond the axis of the legs. Such legged-querns have been dated to a period ranging between second century B.C. and third-fourth century A.D. (below, p. 105). The mullers recovered from the Period were of the normal dumb-bell-shaped variety. A soapstone casket (fig. 36, *6*; pl. XXI, *6*), decorated with incised hatched lines, showed the contemporary workmanship in stone.

Of the twentyfour beads recovered from the Period, as many as ten were of terracotta, six of silicon minerals like carnelian, rock-crystal and quartz (mentioned in order of frequency), five of glass and one each of coral, shell and an indeterminate material. Of these, the claw-shaped pendant in carnelian (fig. 38, *36*; pl. XXII, *36*) and the gadrooned and mallet-shaped ones in glass (fig. 37, *25* and fig. 38, *34*; pl. XXII, *25* and *34*) were outstanding.

Only two terracotta human figurines, produced by the single-mould technique, were recovered from the late levels of the Period. Of these, the one showing a standing female with a child (pl. XXV, *1*), resembling the well-known *aṅkadhātrī* type of the fourth-seventh century A.D., deserves special attention.

Of the remaining industries, the shell bangles, showing a pleasing variety of carved decoration (pl. XXIV), and the bone styluses including an awl (pl. XXIX, *5*) were

noteworthy. The four glass bangle-fragments and a finger-ring (pl. XXIII B, *8* and *9*, respectively), recovered from this Period, were of the translucent variety.

The Period yielded three coins, two of the tribal Ujjayinī type of *circa* first century B.C. from the early levels and one, of doubtful attribution but generally ascribable to *circa* seventh century A.D., from the top levels.

The available evidence indicates that as far as this settlement was concerned, towards the close of Period III, the light seemed to be flickering out.

In review, the cultural equipment of Period III was this. The Period falls within recorded history. The interests of the inhabitants had become diversified and a pattern of settled life was taking shape. Coinage had become an established mode of trade. In metals, the emphasis was more on the production of household objects. Bangle industry, notably of shell, developed sophistication. Rendering in clay of such concepts as *aṅkadhātrī* figurines, occurring in contemporary literature, indicated not only a perfected plastic art but an appreciating public. With all these advanced arts the ceramic industry became relegated to the background. The pottery of this Period was monotonously uninspiring, and in shapes showed little evidence of inventiveness. As expected in such a development, the general repertory of shapes included widely-distributed forms, commonly met with at sites of the early historical period.

D. Period IV

Period IV, which in its lower levels was overlapped with Period III, was distinguished principally by the relative profusion of opaque glass bangles, including the polychrome type (below, pp. 115-18) and the use of two varieties of pottery, viz. the darkish-grey and the mica-dusted light-brown ware (below, pp. 89-93).

Out of an aggregate of fortyfive glass bangle-fragments recovered from the excavation, as many as thirtyeight were obtained from this Period, nine from the early levels and fifteen and fourteen respectively from the middle and late levels. Shell bangles, of which thirtynine examples were recorded from this Period, showed an inverse frequency, being twentynine from the early levels and two and eight respectively from the middle and late levels. Shell industry was evidently becoming less popular. Amongst metal objects, copper accounted for six and iron for thirtysix, noteworthy objects among the latter being a dish (fig. 42, *27*; pl. XXVIII B, *13*), a shaft-hole axe (fig. 43, *29*; pl. XXVIII B, *14*), nails (fig. 42, *18* and *19*), clamp (fig. 42, *23*; pl. XXVIII B, *16*) and ring-fasteners (fig. 42, *25* and *26*; pl. XXVIII B, *18*).

Amongst beads, of which fiftyone were found from the Period, terracotta, glass and carnelian alone were represented by nearly 80 per cent (below, Table IV, p. 111), other materials being shell, paste, quartz, coral and agate (mentioned in order of frequency). A segmented or double variety in glass (fig. 37, *16*; pl. XXII, *16*) deserves special mention.

The terracotta objects comprised a human arm (pl. XXV A, *3*), a bird (pl. XXV B, *4*), a toy-cart wheel with protruding hubs (pl. XXVI A, *2*) and a stopper (pl. XXVI B, *15*). None of these, however, showed any skilful execution.

Three coins, one each from the early, middle and late levels, were recovered (below, p. 130). Of these, the former two were badly damaged, while the latter one, dated to the beginning of the Christian era, seemed to be deposited out of chronological context.

Briefly speaking, the Period witnessed further adoption of the metal, particularly iron for domestic and industrial use. Vessels of metals replaced those of earthenware in the houses of those who could afford them. As a result, the ceramic industry lost all artistic merit and was marked by rigid discipline in forms some of which were apparently borrowed from metal. Glass industry equally showed an impulse towards mass production.

4. THE CUTTING

Pls. IV-XI

As already stated (above, p. 10), only one cutting, labelled PRK-1 and oriented south-east to north-west, was laid out transversely in one of the rain-gullies facing the Saṅgameśvara-Mahādeva temple (pl. IV). It measured 114 ft. in length and 9 ft. in width, and, save for the initial 9 ft., was throughout dug down to the natural soil, encountered at an average depth of 56 ft. below the present surface. The natural alluvial soil, however, did not present a uniform surface but was found to be eroded towards the slope-side of the cutting. The occupation-deposit related to four cultural periods (above, pp. 10-16).

Period I, extending to an average height of 13 ft. 6 in., was represented by layers 53 A to 45, of which layers 53 A to 49 and 48 to 45 correspond respectively to Sub-periods I A and I B. For a relative sequence, the layers are further grouped as: early, 53 A to 51; middle, 50 to 49 and late, 48 to 45. These layers (pl. IX) were composed largely of clayey earth of varying compactness, showing shades of brown and yellow with charcoal-bits, ash-streaks, burnt earth, calcified grit and sherd-débris as distinguishing components. Layer 53 along with pit 22 A represented the earliest occupation-activity at the site, the deposit of layer 53 A, being non-occupational in content.

Among the early levels, layer 51 was more marked by its charcoal-bit content and was further defined by a small débris-line at the top. To this group also belonged refuse-pits 22, 22 A and 22 B. Notable finds recovered from these early levels included: blades and microliths of types I to VII, with the larger percentage of serrated blades, lunates and trapezes, besides specimens of cores and crested-ridged flakes (fig. 34; pl. XIX); a bicone truncated paste bead (fig. 37, *18*; pl. XXII, *18*); and a painted terracotta bull (pl. XXV B, *5*).

Of the mid-levels, layer 49 with an average thickness of 3 ft. was uniformly deposited and showed in its composition plenty of charcoal-bits, small débris and prominent patches of ash and burnt earth. From this deposit was recovered a pottery-group consisting of a pot of the black-painted red Malwa Ware (fig. 8, *1*; pl. XII B) and three of the white-painted black-and-grey and grey ware (fig. 5, *6*; pl. XII A). Other noteworthy finds from the mid-levels included: blades and microliths of types I to VII, with the larger percentage of blunted-back blades, besides cores and flakes with crested ridge; discular spheroids (fig. 36, *3*; pl. XXI, *3*), carnelian spherical (fig. 37, *1*; pl. XXII, *1*) and shell short-barrel circular (fig. 37, *28*; pl. XXII, *28*) beads; a distinctive spacer and a chisel-ended tooth-pick or pendant (fig. 38, *32* and *33*; pl. XXII, *32* and *33*); two bangle-fragments of shell (pl. XXIV, *22*); a painted terracotta toy cart-wheel (pl. XXVI A, *1*); the curious terracotta 'hones' (pl. XXVI B, *18* and *19*); and an indeterminate copper bit (unillustrated) attesting to the use of copper in the Period.

Layers 48 to 45, grouped as late levels but still representing Sub-period I B, belonged to one compositional class of clayey earth. Layer 48 was dark-brown in colour with an admixture of grit and charcoal-bits; layer 47 was compacter; layer 46 was brighter in appearance with very little of charcoal-bits and was separated from the overlying layer by

streaks of fine gravel; layer 45 was pale-black in colour and contained charcoal-bits and loose patches of earth. Outstanding finds from these layers comprised: blades and microliths of types I to VI, with the larger percentage of parallel-sided flakes or blades, penknife blades and points, besides cores and crested-ridged flakes; spheroid balls; beads of carnelian (fig. 37, *27*; pl. XXII, *27*), coral (fig. 37, *29*; pl. XXII, *29*) shell and paste, including a notable example of a tortoise amulet (fig. 37, *31*; pl. XXII, *31*); two bangle-fragments of shell; and two bone styluses (pl. XXIX, *3*). The strata are further distinguished by the occurrence of the black-painted red Jorwe Ware and the Lustrous Red Ware (below, Table I, p. 26).

Period II, which began after a lapse of time, indicated by a thin barren deposit of gravel (pl. X), extended to an average height of 17½ ft. including the upper 2 ft. of the overlapped portion of Period III. The deposit comprising this Period was represented by layers 44 B to 33 and is grouped as: early, 44 B to 41; middle, 40 to 38 and late, 37 to 33.

In the early levels, layers 44 A and B and 44 did not extend to the entire area of the cutting and were composed of looser earth with ashy streaks and lime-patches. Layer 43 was dark-brown in colour. Layers 42 and 41 were also dark-brown but were marked by deposits of sticky clay towards the slope-side of the cutting. None of the layers, however, was evenly deposited. Noteworthy finds from these early levels comprised: two stone querns of type I (fig. 35, *2*; pl. XX, *2*); one stone muller (fig. 35, *4*; pl. XX, *4*); beads of carnelian and rock-crystal; eleven bangle-fragments of shell (pl. XXIV, *10*) and two of glass (pl. XXIII B, *1*); terracotta caskets (pl. XXVI A, *6* and *7*); five objects of copper including a bangle (fig. 39, *6*) and an open-mouthed channel-tube (fig. 39, *13*); fifteen objects of iron including a rod of round section (fig. 40, *2*; pl. XXVIII A, *10*), a chisel-ended tanged object (fig. 40, *4*; pl. XXVIII A, *1*), a ferrule (fig. 40, *6*; pl. XXVIII A, *7*), a ring (fig. 40, *7*; pl. XXVIII A, *6*), a knife-blade (fig. 41, *11*; pl. XXVIII A, *8*), a tanged arrow-head (fig. 41, *12*; pl. XXVIII A, *2*), a sickle-fragment (fig. 41, *15*) and a lance- or spear-head (fig. 41, *16*; pl. XXVIII A, *3*); a carnelian stick of square section (pl. XXIX, *8*); a pulley-shaped spool of semi-precious stone; and three bone styluses.

In the mid-levels, layers 40 and 39 belonged to one compositional class of sticky clay, sometimes alternating with bands of earth, and layer 38, of looser earth, contained lime-streaks and charcoal-bits. A terracotta ring-well (pl. XI A), sunk into layers 39, 40 and 41, was exposed in sector Q′-U′. From these levels were recovered: four stone querns of type I (fig. 35, *1*; pl. XX, *1*); a stone rubber (fig. 35, *6*; pl. XX, *6*); beads of jasper, quartz-rock-crystal including a lump of twelve in standard bicone hexagonal (fig. 37, *23*; pl. XXII, *23*) and carnelian including the five unusual chain-beads (fig. 37, *30*; pl. XXII, *30*); two bangle-fragments of shell (pl. XXIV, *24*); a terracotta 'head-scratcher' (pl. XXVI A, *11*); six objects of copper, mostly fragmentary; nine objects of iron including three celt-like axe-heads (fig. 41, *13* and *14*; pl. XXVIII A, *9*); a distinctive perfume-casket (pl. XXIX, *6*); a stylus with carved head (pl. XXIX, *1*); and five pulley-shaped ear-ornaments (pl. XXIX, *9* and *10*), all of bone.

The late levels of the Period, comprising layers 37 to 33 showed two broad groups: (i) layers 37 to 35, uniformly deposited and composed of sticky clay alternating with patches of earth, and (ii) layers 34 and 33, of darker-coloured loose earth with thin deposits of ash and small débris separating the two. The latter group incidentally represented also the overlapped portion between Periods II and III. Notable finds from these levels included: two querns, one each of types I and II, a muller and a rubber of stone; beads of quartz, jasper, rock-crystal, agate, bone, coral and terracotta including a terracotta scabbard-type pendant (fig. 38, *41*; pl. XXIII A, *41*); a bangle-fragment of shell; a feeder-like terracotta object (pl. XXVI A, *9*); ten objects of copper including an antimony-rod

(fig. 39, *1*; pl. XXVII A, *3*), rings (fig. 39, *11* and *12*; pl. XXVII A, *4* and *5*), a lid (fig. 39, *7*) and rim-fragments of a bowl; six objects of iron including a rod (fig. 40, *1*), a clamp (fig. 40, *3*; pl. XXVIII A, *4*) and a nail (fig. 40, *8*); an ivory comb (pl. XXIX, *7*); eight bone styluses including a borer (pl. XXIX, *4*); two defaced punch-marked coins; and ten sherds of the Northern Black Polished Ware (below, pp. 71-75; Table II, p. 27). A soak-pit consisting of seven jars with perforated bottoms was associated with these levels in sector U'-Z'. Through constant use, however, the jars had become very fragile, the uppermost being almost broken.

Period III, represented by layers 34 to 17, extended to a height of 14 ft., of which the initial 2 ft. overlapped with Period II and the terminal 2 ft. with Period IV. The deposit is classified as: early, layers 34 to 33 (overlapped) and 32 to 29; middle, 28 to 24 and late, 23 to 17.

In the early levels, layer 32 was almost featureless, while layers 31 and 30 were more marked, the latter composed of black cloddy earth with charcoal-streaks and loose earth-patches on the slopy side of the cutting. Overlying this was a débris of tile and brick-bats, labelled layer 29, and representing perhaps the collapse of a structure. Two coins of tribal Ujjayinī type (pl. XXVII C, *1* and *3*) and two querns of type II (fig. 35, *3*; pl. XX, *3*), along with three mullers (fig. 35, *5*; pl. XX, *5*) and a flat rubber, constituted the noteworthy finds of this level. Other finds included: beads of carnelian, coral, glass and terracotta; thirteen bangle-fragments of shell; seven objects of copper including an antimony-rod (fig. 39, *2*) and a bell (fig. 39, *8*; pl. XXVII A, *8*); twelve objects of iron including a bangle-fragment (fig. 42, *22*; pl. XXVIII B, *17*), a chopper (fig. 42, *28*; pl. XXVIII B, *15*) and a shaft-hole axe (fig. 43, *30*); an object of lead (fig. 44, *2*; pl. XXVII B, *2*); and four bone styluses including an awl (pl. XXIX, *5*).

In the mid-levels, layers 28 to 26 were uniformly deposited and were differentiated from each other by streaks of earth or ash; layer 25, showing in its composition brick-débris, was quite distinctive; layer 24, of the same composition, was marked by patches of loose earth. A decorated soapstone casket (fig. 36, *6*; pl. XXI, *6*), beads of quartz, rock-crystal, carnelian, glass and terracotta, fortyfour bangle-fragments of shell, four objects of copper including a bell (fig. 39, *9*; pl. XXVII A, *7*), six objects of iron including a bobbin-like object with a central perforation (fig. 43, *37*; pl. XXVIII B, *19*), a spool of lead strip fig. 44, *1*; pl. XXVII B, *1*) and a stylus were recovered from this level. Of dating-value, however, was the lowest occurrence of the sherds of the typical Red Polished Ware in layer 28.

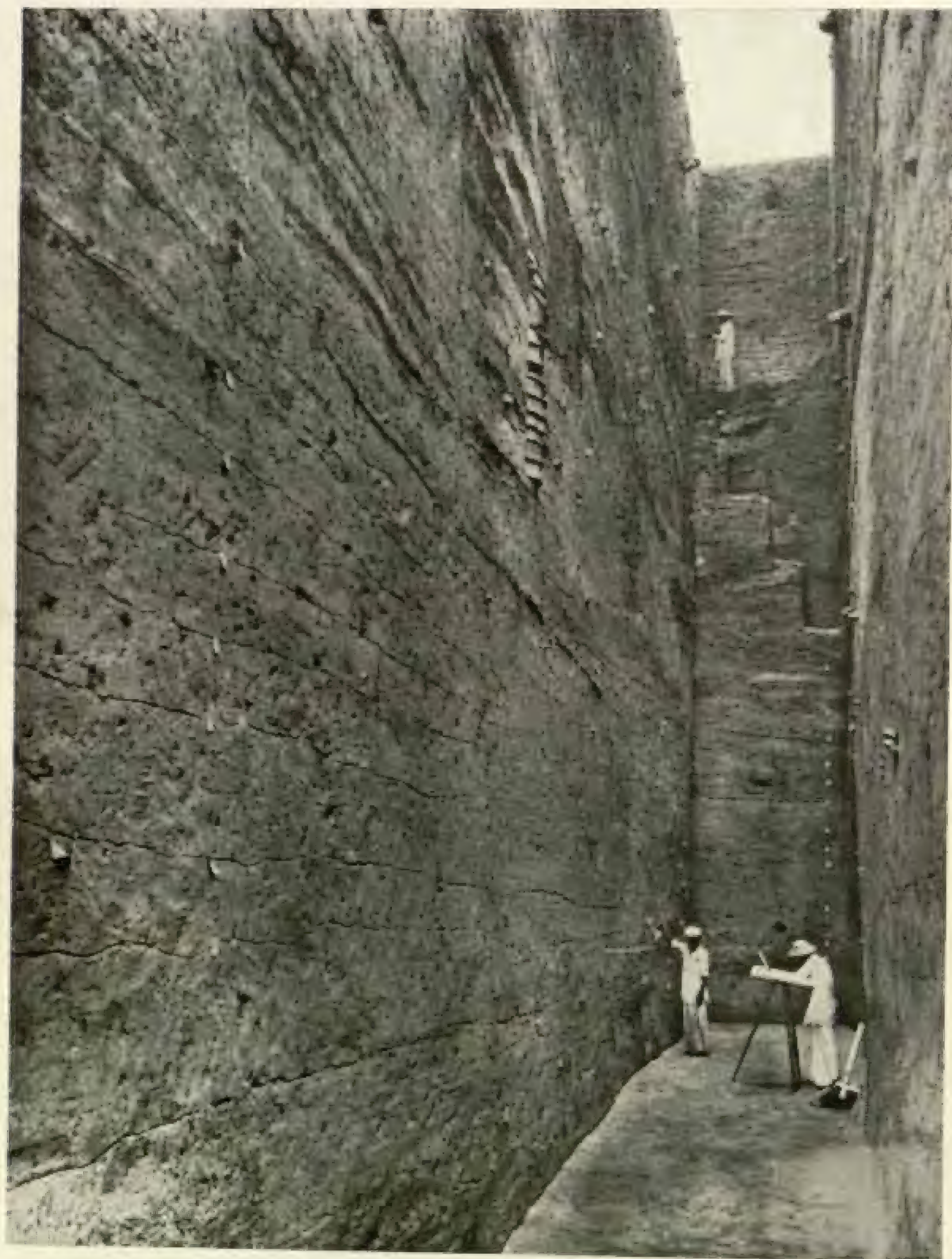
In the late levels, layers 23 to 21 formed one compositional class of soft clayey earth, occasionally mixed with ash. Overlying this was a compact deposit, lebelled layer 20, topped by brick-bats. Layer 19 was a thin deposit of evenly-spread brownish earth. In sectors II to IV, a baked-brick wall (pl. VI B) running in an east-west orientation was found resting over this layer. The size of the bricks used was $16 \times 11 \times 2 \cdot 7$ in. The wall was available to a height of four courses and was exposed to a length of 5 ft., its complete width being not available. At its top, were traces of holes presumably to hold posts for the superstructure which evidently had perished. Layer 18, of softer earth, was associated with this structure, while layer 17, composed of compact earth and débris, sealed it. From this level were recovered: a stone muller; a spheroid stone ball (pl. XXI, *4*); beads of carnelian (fig. 38, *36*; pl. XXVII, *36*), shell and terracotta; fiftynine bangle-fragments of shell and four of glass; two terracotta human figurines including the *aṅkadhātrī* (female with child) type (pl. XXV A, *1* and *2*); a flesh-rubber (pl. XXVI B, *12*); three objects of copper including a pin (fig. 39, *4*; pl. XXVII A, *1*) and a fragmentary bangle (fig. 39, *5*; pl. XXVII A, *6*); three objects of iron including a punch (fig. 42, *20*; pl. XXVIII B, *12*); and a coin (pl. XXVII C, *2*).



A. *Prakash: lay-out of the cutting before excavation, looking south. Rivers Tapti and Gomai can be seen respectively in the farther and middle distance. Scale of feet.*
See p. 16

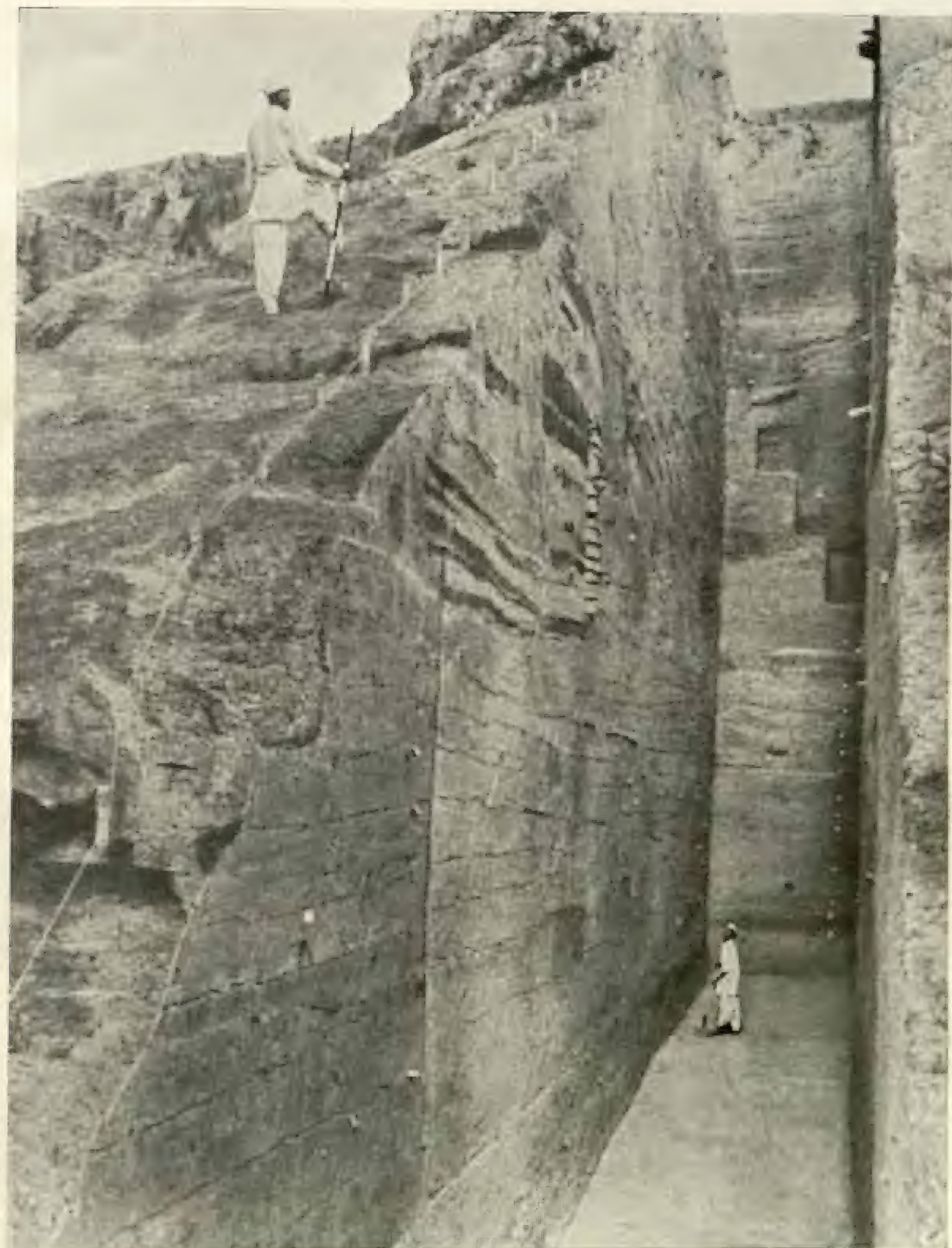


B. *Cutting PRK-1: close view of the baked-brick wall of Period III. Scale of inches.*
See p. 18



Cutting PRK-1: showing part of the complete section, looking north-west. *See p. 16*

To face pl. VIII



Cutting PRK-1: showing complete view of the excavated trench, looking north-west. *See p. 16*

To face pl. VII



Cutting PRK-1: close view showing the strata of Period I, the top of which is marked by a thin gravel deposit indicated along AA. The whitish layer at the bottom represents the natural soil. Scale of feet. *See p. 16*

To face pl. X



Cutting PRK-1: section showing the weathered surface, indicated by a thin gravel deposit, marking the end of Period I. Scale of feet. *See p. 17*

To face pl. IX



A. *Cutting PRK-1: terracotta ringwell, Period II. Scale of feet.* *See p. 17*



B. *Cutting PRK-1: soak-pit made of jars with open bases, Period II. Scale of feet.* *See p. 18*

To face p. 19

Period IV, represented by layers 19 to 1, covered 16 ft. of deposit, of which the initial 2 ft. was bracketed with Period III. The deposit is classified as: early, 19 to 17 (overlapped) and 16 to 11; middle, 10 to 7; and late, 6 to 1.

In the early levels, layers 15 and 12 and 11 were almost identical in composition and were separated by a prominent clayey deposit, labelled 14 and 13, the latter showing an admixture of earth. Nothing particularly interesting was recovered from this level except: beads of carnelian, coral, quartz, paste, shell, terracotta and glass including the segmented variety in the last-mentioned material (fig. 37, *16*; pl. XXII, *16*); twentynine bangle-fragments of shell and nine of glass; a terracotta human arm (pl. XXV A, *3*); four objects of copper; seven objects of iron; and a defaced coin.

In the mid-levels, layers 10 and 9, composed of compact hard brown earth mixed with grit, were very prominent and were uniformly deposited in the entire area of the cutting. The overlying layer, 8, was distinguished by looser earth occasionally with brick-débris. At one place, however, was encountered a small heap of bricks, most of them broken and re-used. Layer 7 was almost featureless, being made of loose earth and clay-patches. Noteworthy finds from this strata included: a Gaṇeśa figurine in sandstone (fig. 36, *7*; pl. XXI, *7*); beads of carnelian, paste, glass and terracotta (figs. 37, *5* and 38, *42*; pl. XXII, *5* and pl. XXIII A, *42*); two bangle-fragments of shell and fifteen of glass; an object of copper; nine objects of iron including a dish (fig. 42, *27*; pl. XXVIII B, *13*) and a shaft-hole axe (fig. 43, *29*; pl. XXVIII B, *14*); and a corroded coin.

In the late levels, which were disturbed by pits and were also eroded notably towards the slope side of the cutting, only layers 4 and 3 were dependable and worth consideration. The former was composed of hard compact earth containing at places brick débris. A few complete bricks, measuring 15×10×3·5 in., were recovered from this deposit. Layer 2, of loose earth and yielding very little pottery, was deposited against the slope of layer 3. Pit 2, sealed by surface-humus and containing later material including ash, charcoal-bits and stones seemed to have been dug after the desertion of the site. These levels yielded: beads of carnelian, agate (fig. 37, *4*; pl. XXII, *4*), quartz (fig. 37, *3*; pl. XXII, *3*), shell (fig. 37, *6*; pl. XXII, *6*), glass and terracotta; eight bangle-fragments of shell and fourteen of glass; a terracotta bird (pl. XXV B, *4*); an object of copper; twenty objects of iron including nails (fig. 42, *18*, and *19*); a coiled ring (fig. 42, *21*), a clamp (fig. 42, *23*; pl. XXVIII B, *16*) and ring-fasteners (fig. 42, *25* and *26*; pl. XXVIII B, *18*); and a coin (pl. XXVII C, *4*), though out of chronological context.

5. CHRONOLOGY

Figs. 1 and 2; pls. V, VII and VIII

The datable objects recovered from the present excavation were very few indeed. For computing an absolute time-table for the site, the indirect evidence from other sites stratigraphically interrelated and more extensively excavated may be utilized. Briefly, the main evidence is provided by: for Period I, radioactive-carbon determinations[1]

[1] Elizabeth K. Ralph, 'University of Pennsylvania radiocarbon dates III', *American Journal of Science, Radiocarbon Supplement*, I (1959), pp. 51-53; Robert Stuckenrath, Jr., 'University of Pennsylvania radiocarbon dates VI', *Radiocarbon*, 5(1963), pp. 92-93; S. Kusumgar, D. Lal and R. P. Sarna, 'Tata Institute radiocarbon date-list I', *ibid.*, pp. 273-82. These dates have been recalculated using a half-life value of 5730 years with A.D. 1950 as the standard year of reference. Cf. B. B. Lal, 'A picture emerges—an assessment of the Carbon-14 datings of the protohistoric cultures of the Indo-Pakistan sub-continent', *Ancient India*, nos. 18 and 19 (1962 and 1963), pp. 208-21.

from the 'chalcolithic' or 'Copper Age' strata at Navdatoli, Ahar, Chandoli, Nevasa, Eran and Lothal; for Period II, (i) use of iron, (ii) black-and-red ware and (iii) the Northern Black Polished Ware; for Period III, (i) tribal Ujjayini coins, (ii) terracotta figurine of the well-known *aṅkadhātrī* type and (iii) the Red Polished Ware; for Period IV, (i) opaque glass bangles including the polychrome variety and (ii) Gaṇeśa image in sandstone.

PERIOD I.—Ceramic industries of this Period afford some workable parallels with other sites in the region. Besides Prakash, the black-painted red pottery of the Malwa Ware has been found at : Navdatoli, protohistoric period,[1] Phases I to IV; Nagda, Period I; Bahal, Sub-period I B; Daimabad, Phase II; and Chandoli, Period I[2] (below, p. 37). The black-painted red pottery of the Jorwe Ware has been found, again besides Prakash, at: Navdatoli, protohistoric period, Phases III and IV; Bahal, upper levels of Sub-period I B; Daimabad, Phase III; Nevasa, chalcolithic period; Chandoli, Period I; Jorwe, Period I; and Ahar, Sub-period I B (below, p. 49). The stratigraphic priority of the former industry to that of the latter, first recognized at Prakash,[3] is now confirmed at Navdatoli, Bahal and Daimabad. Furthermore, the occurrence at Prakash of a single sherd of the white-painted black-and-red ware of the Ahar fabric and a few sherds of the Lustrous Red Ware, respectively in the earliest level of Sub-period I A and almost throughout the strata of Sub-period I B (excepting layer 48), while reinforcing the links with Navdatoli, ties up the sequence with that of Ahar. Confining this comparative study to sites whence Carbon-14 dates are available, viz. Navdatoli, Ahar, Nevasa, Chandoli and Eran, it is seen that Sub-period I A at Prakash is broadly contemporaneous with Phases I and II at Navdatoli and the upper levels of Sub-period I A at Ahar, and Sub-period I B at Prakash with Phases III and IV at Navdatoli, Sub-period I B and I C at Ahar, Period I at Chandoli and the chalcolithic period at Nevasa. The sequence at Prakash thus reflects the evidence of Navdatoli, with modifications of Nevasa and Ahar.

Now to turn to the conversion of this relative sequence into one with dates. For Phase I of the protohistoric period at Navdatoli (Period III), four radioactive-carbon determinations are available, of which three, respectively at 1645 ± 130 B.C. (P-201), 1610 ± 130 B.C. (P-200) and 1610 ± 70 B.C. (P-475), are from the earlier levels, and the remaining one, at 1530 ± 110 B.C. (TF-59), is from the late levels. The last-mentioned sample was collected from a trench exposed for two years after excavation, followed by water-logging, and in addition contained rootlets with possibilities of contamination. The upper half of Sub-period I A at Ahar, for which an initial date of 1725 ± 140 B.C. (TF-34) has been measured, is, in the main, contemporary with it. It will be seen that although there is a difference of 80 and 115 years respectively on mean between this date and those of Navdatoli, within error of one standard deviation, the two sets of determinations are almost the same. A single determination from an early level of the chalcolithic strata at Eran is dated to 2035 ± 75 B.C. (P-529). This falls outside two standard deviations as compared with the Navdatoli series and well beyond one with reference to the Ahar one. Furthermore, in view of the two Carbon-14 dates at 1865 ± 110 B.C. and 1810 ± 140 B.C. (respectively TF-23 and TF-19) for Period B, Phase V A (being the penultimate Sub-phase

[1] It may be noted that the excavators of Navdatoli have labelled this protohistoric period as Period III, their Periods I and II being prehistoric, respectively Early and Middle Stone Age, covering the sequence in a much wider area than Navdatoli. Cf. Sankalia, Subbarao and Deo, *op. cit.* (1958). The same remark applies to the division of Periods at Nevasa where the chalcolithic occupation is designated as Period III. Cf. Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), pp. 67 and 68.

[2] Cf. *Indian Archaeology 1955-56—A Review* (1956), pp. 11-19; *ibid., 1956-57* (1957), p. 17; *ibid., 1958-59*, (1959) p. 17, and S. B. Deo and Z. D. Ansari, *Chalcolithic Chandoli* (Poona, 1965), p. 47.

[3] Ghosh, *op. cit.* (1956), p. 2; also Subbarao, *op. cit.* (1956), p. 48.



FIG. 2. *Comparative chronology of some chalcolithic sites: the solid columns indicate the chronological range proposed by the respective excavators, and the hatched ones show the time-spread provided by the Carbon-14 determinations*

of the Late Harappa settlement) at Lothal, the Eran date does not seem to be interrelated and cannot be used without reserve. On the above showing, it is reasonable to assign the beginning of Sub-period I A at Prakash to *circa* 1700 B.C. This date seems to provide a measure of agreement between the sequence obtained by stratification and association and that obtained by radio-carbon determination. The terminal date of this Sub-period, however, cannot be fixed with the same certitude. The measured dates at 2300 ± 70 B.C. (P-476) and 1660 ± 130 B.C. (P-202), respectively from the middle and late levels of Phase II at Navdatoli, equated with the upper levels of Sub-period I A at Prakash, do not conform to the framework of stratigraphic sequence and as such are of no avail in our reckoning. However, from the 8½-ft. average depth of occupational deposit represented by this Sub-period (pl. V), about 150 to 200 years would seem a reasonable estimate.

The duration of Sub-period I B of Prakash is rather difficult to compute. There are two carbon-determinations from the corresponding strata (Phases III and IV) at Navdatoli which span a range from 1600 ± 130 B.C. (P-204) to 1440 ± 130 B.C. (P-205). Besides, for an identical assemblage, there is a cluster of five determinations from Chandoli (early level of Period I), two from Ahar (one each from middle and late level of Sub-period I C) and three from Nevasa (late level of Period III). Of these, one from Nevasa, dated to 670 ± 120 B.C. (P-184), was reported to be contaminated during shipment, and two from Chandoli, dated to 1175 ± 120 B.C. (TF-42), and 1040 ± 105 B.C. (TF-43), and one from Ahar, dated to 1550 ± 110 B.C. (TF-32), contained rootlets. The remaining ones, three from Chandoli (P-472 to 74), two from Nevasa (P-181 and TF-40) and one from Ahar (TF-31) produce a concievable and consistent span from 1330 ± 70 B.C. (P-473) to 1250 ± 125 B.C. (P-181). From the point of view of geographic distribution, these dates slightly complicate the issue. It is often postulated that the primary home of the Jorwe Ware is in the Godavari-Pravara basin whence it diffused to other chalcolithic sites in central India including as far north as Ahar. Strangely enough, the available Carbon-14 determinations from sites in the peripheral region like Navdatoli (P-204 and P-205) and Ahar indicate an earlier horizon for this Ware than that from sites within the centres of diffusion, viz. Chandoli and Nevasa (P-472 to 74, P-181 and TF-40). In view of the ceramic continuity through this range, one would expect a lower run for this assemblage on some site in northern Deccan or has to surmise a still-unknown third source from where it could have spread to both these regions, viz. the northern Deccan and central India. As stated above, the measured dates from Nevasa, 1250 ± 125 B.C. and 1255 ± 115 B.C., are for the terminal phase of the Period. It is arguable that the earlier levels, underlying a 7-ft. deep accumulation, may belong to *circa* 1500 B.C.,[1] or still earlier, taking into consideration the carbon-determinations for Phase III at Navdatoli (P-204). Against this time-scale from *circa* 1600 to 1000 B.C., represented by the currency of the black-painted red pottery of the Jorwe Ware, it is difficult to fix with precision the duration of Sub-period I B at Prakash. Since, however, the site is situated in the Tapti valley, the geographical vestibule of the Deccan from the north, the possibility of a somewhat longer duration of the Jorwe Ware on this site as compared with Navdatoli may not be ruled out.

After the chalcolithic settlement, the site of Prakash seems to have been abandoned. The top surface of the 13½-ft. high mound, representing the accumulation of Period I, became weathered and overlain by a barren layer of 2 to 3 in. thick fine gravel (p. 17; pls. IX and X). Hereafter, the occupation was continuous; Periods II to IV were interlocked by significant overlaps (pp. 14, 15, 18 and 19; pl. V).

[1] Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 68.

Period II.—As has been said above (p. 12), iron was in use almost right from the earliest level of the Period. In the context of general archaeological stratigraphy, this occurrence belongs to the early phase of the use of iron in the sub-continent. Objective evidence for the discovery of the technique or the initial occurrence of iron in India is inconclusive.[1] On the basis of literary evidence, a date around 1000 B.C., was suggested for the introduction of iron-smelting in India.[2] The occurrence of iron in the strata preceding the appearance of the celebrated Northern Black Polished Ware at Alamgirpur, Hastināpura, Kauśāmbī and Śravastī in the Yamuna-Ganga *doab*, and Bahal, Prabhaspatan and Ujjain in western and central India has been interpreted as a pointer in the same direction.[3] The latter view is largely based on the current chronology of the Painted Grey and Northern Black Polished Wares. After a critical review of the evidence, archaeological and historical, it has been averred that iron was introduced into the north-western plains of the sub-continent by the Achaemenid conquerors who extended their empire into the region in the latter part of the sixth century B.C.[4] It may have well been so as far as Gandhāra and the Indus regions are concerned, but to attribute the knowledge of iron of the early Iron Age cultures of central India and the Deccan to the same source[5] would at the present time appear to be an extrapolation, even admitting that metallurgical analysis is needed to determine the structure and method of manufacture of the artefacts in different regions. Working on the basis of literary evidence, as collated with archaeology, a date around 800-700 B.C. has been proposed for the beginning of the Iron Age in the Ganga basin.[6] At the same time, in the present stage of knowledge, a date appreciably earlier than seventh century B.C. for the advent of Iron Age in the Deccan does not seem to be very reliable.[7] The beginning of Period II, therefore, may be placed

[1] H. H. Coghlan, *Notes on Prehistoric and Early Iron in the Old World* (Oxford, 1956), p. 67.

[2] R. J. Forbes, *Metallurgy in Antiquity* (Leiden, 1950), pp. 436.

[3] S. D. Singh, 'Iron in ancient India', *Journal of the Economic and Social History of the Orient*, V, pt. II (Leiden, July 1962), pp. 212-16; Lallanji Gopal, 'Antiquity of iron in India', *Uttara-Bharati*, IX, no. 3, pp. 71-86; *Journal of the Andhra Historical Research Society*, XXVIII, pts. 1 and 2 (1962-63), pp. 39-54; G. R. Sharma, *The Excavations at Kauśāmbī, 1957-59* (Allahabad, 1960), p. 13; B. R. Subrahmanyam, 'Appearance and spread of iron in India—an appraisal of archaeological data', *Journal of the Oriental Institute*, XIII, no. 4 (Baroda, June 1964), pp. 349-59; N. R. Banerjee, *Iron Age in India* (Delhi, 1965).

[4] Mortimer Wheeler, *Early India and Pakistan* (London, 1959), pp. 24 and 164; 'Ancient India, the civilization of a sub-continent', *The Dawn of Civilization* (London, 1961), pp. 250-51; *Charsada, a Metropolis of the Northwest Frontier* (London, 1962), pp. 13, 33, 34, 43 and 44; H. D. Sankalia, 'India', *Courses towards Urban Life* (New York, 1962), ed. Robert J. Braidwood and Gordon R. Willey, p. 78.

[5] Wheeler, *op. cit.* (1959), p. 146.

[6] D. D. Kosambi, 'The beginning of the Iron Age in India', *Journal of the Economic and Social History of the Orient*, VI, pt. III (Dec. 1963), pp. 309-18. A Carbon-14 determination from Atranjikhera, District Etah in Uttar Pradesh, gives a date of 1025 ± 110 B.C. (TF-191) for the strata showing the earliest use of iron (below, p. 163). Another recent C-14 determination from Chirand, District Saran in Bihar, for a similar pre-N.B.P. Ware strata, showing the earliest appearance of iron at the site, is dated to 765 ± 100 B. C. (TF-336). Cf. D. P. Agrawal, Sheela Kusumgar and M. Unni Krishnan, 'Radiocarbon dates of samples from N. B. P. Ware and Pre-N. B. P. ware levels,' *Current Science*, 35, no. 1 (January 1966), p. 3. More confirmatory evidence is, however, needed to establish this time-range for the use of iron in the Ganga basin.

[7] Cf. D. H. Gordon, 'The early use of metals in India and Pakistan', *Jour. Roy. Anthropological Inst.*, LXXX, 1950, pts. I and II (1952), p. 67; B. Subbarao, 'Rise of Magadha in Indian history and archaeology', *Journal of the Oriental Institute*, X, no. 4 (June 1961), p. 372; K. V. Soundara Rajan, 'Community movements in protohistoric India—an archaeological perspective', *Journal of the Oriental Institute*, XII, no. 1 (September 1962), pp. 80-82, and F. R. Allchin, *Piklihal Excavation*, Andhra Pradesh Government Archaeological Series no. 1 (Hyderabad, 1960), p. 128.

somewhere towards the close of the seventh century B.C. with a margin on the earlier side, depending upon the objective dating for the appearance of iron in the region.

The black-and-red ware associated with this early phase of the Iron Age has not so far been objectively dated. Its sequential position before the emergence of the N.B.P. Ware is attested at sites both in the northern plains (Rajghat, Sonpur and Prahladpur), and the central and western India (Ujjain, Nagda, Bahal and Maheshwar). This brings us to the date of the Northern Black Polished Ware, which has rightly been termed as a godsend to the archaeologist.[1] But there is no unanimity about the initial date of this Ware. However, even on conservative estimates, it is not likely to be later than the fifth century B.C. in the nuclear region.[2] What concerns us most in regard to the evidence from Prakash is the period of its diffusion in the peripheral areas. The number of sherds and the associated objects leave no manner of doubt that this spread occurred essentially between the third and second centuries B.C. and coincided with the expansion of the Mauryan Empire.[3] The N.B.P. Ware sherds at Prakash occur between layers 37 and 34, both inclusive. These strata would represent a range of early third to mid-second century B.C. On the above showing the terminal date of Period II, which extended up to layer 33, may be fixed at *circa* 100 B.C.

PERIOD III.—Two tribal Ujjayinī coins, datable to *circa* second first century B.C., were found in layer 31. This fits in well with the uppermost find of the N.B.P. Ware nearly 2½ ft. lower down in layer 34, to which a date in the mid-second century B.C., has been ascribed. Higher up, from layer 28, sherds of the Red Polished Ware, ascribable to the first four centuries of the Christian era (below, p. 84), start appearing and continue up to layer 25. From layer 19, in the deposit overlapping between Periods III and IV, was obtained a mother-and-child figurine of the *aṅkadhātrī* type (pl. XXV A, *1*), usually assigned to *circa* fourth to seventh century A.D. (below, p. 118). From the succeeding layer 18, an otherwise insecurely-dated coin of *circa* seventh century A.D. (pl. XXVII C, *2*) was recovered. The evidence of these finds shows an internal consistency borne out by stratigraphic sequence. Period III may, therefore, be regarded to have come to a close in *circa* A.D. 600.

PERIOD IV.—Apart from the profusion throughout the Period of the opaque monochrome glass bangles, with the polychrome variety occurring only in the latter half, a small sandstone image of Gaṇesa, reasonably attributable to *circa* eighth-ninth century A.D. (pl. XXI, *7*) and found midway in the accumulation, would provide a workable datum for determining the relative chronology for this Period. Over this was a good 10-ft. thick deposit involving occupation levels which, on a reasonable estimation, may represent one hundred and fifty to two hundred years of accumulation. The end of Period IV may thus be placed somewhere in the eleventh century A.D. The ceramic industry of the Period is essentially non-descript and does not afford any significant datable parallels.

In summary, the chronology of the site is as follows:

PERIOD I (CHALCOLITHIC): *circa* 1700-1300 B.C.—Sub-period I A, 1700-1500 B.C. and Sub-period I B, *circa* 1500-1300 B.C.

PERIOD II (EARLY IRON AGE): *circa* 600-100 B.C. with a margin on the earlier side.

PERIOD III (EARLY HISTORICAL): middle of the second century B.C. to the end of the sixth century A.D.

PERIOD IV (HISTORICAL): about the end of the sixth century A.D. to the eleventh century.

[1] Wheeler, *op. cit.* (1959), p. 24.

[2] *Ancient India*, no. 1 (1946), pp. 55-58.

[3] *COWA Surveys and Bibliographies*, Southern Asia, Area 16, no. II (1960), p. 6.

6. THE POTTERY

A. Introductory

The pottery from Prakash falls into four major groups, each of which forms a diagnostic trait in the cultural assemblage of the Period to which it belongs. Of these, the first two are of special interest in the context of current research and have, therefore, been dealt with in some detail. The characteristic features of each group along with the representative forms are described in a chronological order (below, pp. 28-93). In anticipation of the more detailed discussion, it would suffice to give here a digest of the sequence.

The earliest group is a promiscuous one, being characterized by six principal industries: (i) pale-grey ware, often turning to black-and-grey as a result of inverted firing and painted in white on a burnished surface; (ii) black-painted red pottery of the Malwa Ware; (iii) black-painted red pottery of the Jorwe Ware; (iv) the Lustrous Red Ware; (v) other decorated ware, showing distinctive incised and applied designs of varying complexity; and (vi) coarse wares, largely burnished, varying from drab-grey to light-brown in colour and sometimes having the rim-portion stained with red ochre, and other plain wares. All of these wares show similarities with the pottery of the comparable period found at some of the excavated sites in central and western India. A solitary sherd of the white-painted black-and-red ware of the Ahar fabric (fig. 5, *10*), dealt with under category (i), is particularly noteworthy for an interrelationship.

Table I (below, p. 26) shows the frequency distribution and the percentage (in italics) of each industry in the strata of Period I. It will be seen that the painted pottery of the Jorwe Ware and the Lustrous Red Ware occur only in the upper levels, whereas the other industries run throughout the occupation. With a view to understanding the syntax of the painting styles, typical designs of each class of painted pottery have been separately illustrated, complementary to the corresponding forms. Thus, both the graphic and the intimately-related plastic media of each painted ware have been adequately analysed for any comparative analysis.

In the next group, which was marked by a great change and innovation in pottery-tradition, the black-and-red ware and the celebrated Northern Black Polished Ware claim our attention. Of these, the former occurs throughout the occupation of Period II, while the latter is confined only to the upper four layers. Although the number of sherds found of this distinctive trade Ware is not sufficiently large, their presence indicates intercourse with the civilization of the northern plains and provides an approximate datum for fixing the chronology of the Period. It cannot, however, be claimed that these sherds can be a used with certainty as chronometer.

Besides, a nondescript red ware of medium fabric, both slipped and unslipped, and a blotchy red ware with a vesiculated fabric are also present. A table showing the frequency distribution of each class of ware is appended (Table II, below, p. 27).

The third group, which also overlapped the preceding one, comprises a dull-red ware, essentially uninspiring and presenting forms commonly met with at sites of the early historical period. By comparison with what preceded in the earlier groups, this pottery is poorly made. The occurrence of the Red Polished Ware in the well-known type-fossil sprinkler-form is, however, noteworthy. This again invests the sequence with some precision.

TABLE I

FREQUENCIES AND PERCENTAGES (FIGURES IN ITALICS) OF SHERDS OF THE CERAMIC INDUSTRIES IN EACH LAYER OF PERIOD I

Layer / Industry	White-painted pale-grey and black-and-grey ware	Black-painted red Malwa ware	Black-painted red Jorwe ware	Lustrous red ware	Other decorated ware	Coarse burnished ware	Other plain ware
45	41 *12·50*	183 *55·79*	49 *14·93*	2 *·61*	11 *3·35*	13 *3·96*	29 *8·84*
46	57 *12·55*	259 *57·04*	45 *9·80*	1 *·21*	15 *3·30*	36 *7·92*	41 *9·03*
47	59 *13·31*	270 *60·94*	19 *4·29*	3 *·61*	18 *4·06*	47 *10·60*	27 *6·09*
48	65 *14·80*	252 *57·40*	20 *4·54*	..	21 *4·78*	37 *8·42*	44 *10·02*
49	192 *22·19*	514 *59·42*			40 *4·62*	77 *8·90*	42 *4·86*
50	157 *15·76*	717 *71·98*			42 *4·21*	60 *6·02*	20 *2·00*
51	130 *26·42*	288 *58·53*			23 *4·67*	38 *7·72*	13 *2·64*
52	172 *30·99*	240 *43·24*			31 *5·58*	68 *12·25*	44 *7·92*
53 and 53A	132 including one sherd of the white-painted black-and-red ware of the Ahar fabric *34·46*	167 *43·60*			6 *1·56*	48 *12·53*	30 *7·83*
Total yield and percentage	1005 *20·28*	2890 *58·32*	133 *2·67*	6 *·12*	207 *4·17*	424 *8·55*	290 *5·85*

TABLE II

FREQUENCIES AND PERCENTAGES (FIGURES IN ITALICS) OF SHERDS OF THE CERAMIC INDUSTRIES IN EACH LAYER OF PERIOD II

Layer \ Industry	Black-and-red ware	Northern Black Polished Ware	Other wares
33	10 *9·09*		100 *90·90*
34	11 *11·00*	3 *3·00*	86 *86·00*
35	39 *17·72*		181 *82·27*
36	34 *20·23*	5 *2·97*	129 *76·78*
37	92 *29·39*	2 *0·63*	219 *69·96*
38	82 *31·90*		175 *68·09*
39	72 *30·12*		167 *69·87*
40	99 *33·44*		197 *66·55*
41	95 *38·46*		152 *61·13*
42	156 *42·27*		213 *57·72*
43	106 *40·30*		157 *59·69*
44—44B	278 *55·48*		223 *44·51*
Total yield and percentage	1074 *34·83*	10 *·32*	1999 *64·83*

The last group, which also overlapped the preceding one, consists largely of two wares: (a) darkish grey ware characterized by a black-slipped surface and multiple grooves on the shoulder and (b) red ware including the mica-dusted light-brown ware. The pottery of this period has hitherto received only summary treatment with the result that

no well-defined industries with known distribution in space and time can be distinguished, and there is little to assist in their proper attribution. In fact, pottery of everyday use seems to be of negligible interest during this period.

The quantified data of sherd-count shown in Tables I and II were compiled as follows: The excavated sherds from each layer, after being washed, were separated into different wares or fabrics. The sherds of each fabric were then counted with due regard to their component parts, viz. rims, necks, shoulder, belly, etc. Recently, however, it has been advocated that in quantified potsherds, both the mass and the number are of importance and it is of inferential value to work out both sherd-weight and sherd-counts.[1] This method of analysis, used with fruitful results on the earthenware from sites in Sarawak and Fuji, still remains to be tested on pottery from Indian sites. Although there are obvious advantages in the application of this statistical method, caution need be exercised while using it for archaeological interpretation.

B. Period I

(i) *The white-painted pale-grey and black-and-grey ware*

This ware has a wholly individual appearance, distinct alike in fabric and form from the rest. Throughout made on wheel, it shows an egg-shell lustre as a result of continuous horizontal burnishing. The surface-colour ranges from grey to tan-brown through shades of greyish yellow-red, a large percentage, however, having burnt black-and-grey as a result of inverted firing showing black inside and black-and-grey outside with black confined to the upper portion. The texture of the paste employed is dense with sparse-to-medium concentration of the inclusions, comprising both finer vegetable-matter and minerals, and produces an essentially straight but rough fracture. The ware is fired at a medium temperature and often exhibits a darkened unoxidized portion of the core, mostly towards the inner side.

On the burnished surface are painted both linear and dotted patterns in a fugitive white pigment which does not show any fusion with the body and often leaves indistinct impressions discernible only to the versed eye. The decorative theme is essentially a variation of the few constituent elements, like dotted, wavy, or zigzag lines, sometimes with fronds, dashes and herring-bones in different dispositions. The cumulative effect of these elements shows a simple balanced ornament. The designs, which are essentially repetitive and are composed, frequently but not invariably, of groups of the same elements, symmetrically arranged with empty spaces in between, are painted both on the outside and inside of the pots with a marked preference for the latter. On the outside (fig. 3), these consist of obliquely-converging lines in groups of one to four, the field of decoration being confined largely to the portion above the maximum girth with the whole vase as a free field without stressing any particular structural feature. On the inside (figs. 3 and 4), they include, besides the converging lines, groups of dots, dashes, herring-bones and short meanders, the decoration extending from the lip to the bulge and occasionally to the lower portion. It is noteworthy that the scheme of decoration in each case harmonizes with the form of the vessels; those showing paintings on the inside are, as a rule, wider-mouthed to allow movement of the hand and the brush. The idiom of white patterns on the usually black background of the inside gives a pleasing effect of dark and light values in

[1] Wilhelm G. Solheim II, 'The use of sherd weights and counts in the handling of archaeological data', *Current Anthropology*, I, no. 4 (July 1960), pp. 325-29, and subsequent comments by D. H. Gordon in *ibid.*, III, no. 4 (February 1962), p. 99.

this style. Furthermore, where the decoration exists both on the outside and the inside, the respective areas have been artistically balanced (fig. 3, *D-D′*, *E-E′*, *G-G′*), the whole effect showing a considered planning and sophistication.

The designs were painted with a fine-to-medium brush in free-hand balance. The strokes on the outside run from the rim downwards while on the inside they seem to start from the bottom upwards, the brush being lifted to make a series of separate short strokes. From the direction of the strokes and the spreading flow of the pigment, it is inferred that the pots were always held in the upright position and were rotated during the process of painting.

The shapes represented in this ware are comparatively few and simple. These consist of: (a) the deep spheroid or ovoid bowl with out-turned rim and convex body (fig. 5, *1-3*); (b) the *lotā*-shaped vase (fig. 5, *6*); and (c) the vase with pronounced or ledged shoulder (fig. 5, *9*).

This ware forms about 20 per cent of the total yield of pottery from Period I and is numerically the second. Vertically, it shows a consistent decrease from bottom upwards, indicating that starting as a fully-developed industry with 34·46 per cent in the lowest layer, it became less popular as occupation advanced, with 12·50 per cent in the topmost level.

Apart from Prakash, this characteristic ware has so far been reported from: Bahurupa and Koparli in Dhulia District and Bahal in Jalgaon District of Maharashtra; and Hathod, Kanaria, Khagaria, Marod and Undel in Indore District and Kanwan and Kesur in Dhar District of Madhya Pradesh.[1]

A single sherd of the white-painted black-and-red ware of the Ahar fabric, recovered from the lowest levels (fig. 5, *10*), is particularly noteworthy for a comparison with the above-mentioned ware. Some of the design-elements, particularly the use of dots and short dashes, the considerations of light and dark values and the technique of inverted firing are common to both the traditions.

The design-elements are listed below:

Figs. 3 and 4

A. Converging single lines making opposed triangles; painted on the outside, with the field of decoration extending from the rim to the girth.

B. Converging lines in groups of five each, other features being the same as in A above.

C. Zigzag line; pattern of the white-painted black-and-red ware of the Ahar fabric.

D. Converging lines in groups of three each, other features being the same as in A and C above. D′, on the inner curve of the rim of the same vase, consists of obliquely-inclined short strokes in groups of five each. With a view to bringing out the aesthetic balancing, as conceived by the potter, the design on the inside, marked D′, is shown with the rim-portion common to that of the outside, marked D.

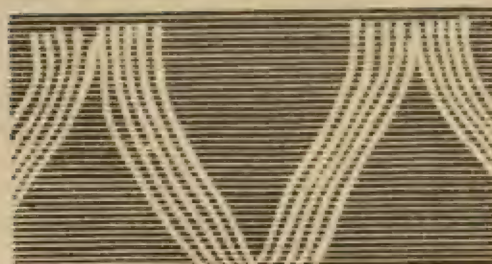
E. Converging lines in groups of two each, other features being the same as in A above. E′, on the inner curve of the rim, consists of vertically-inclined strokes in groups of four each.

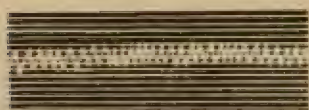
F. Converging lines with fronds, other features being the same as in A above.

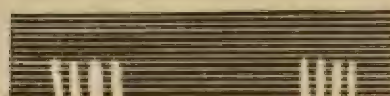
G. Converging lines with fronds in groups of two each giving the effect of pendant triangles. G′, on the inner side, shows wider-based triangles. The fronds on the outside are one directional and face towards the right while on the inside they show a converging behaviour within the triangles.

[1] *Indian Archaeology—A Review*, *1957-58*, *1958-59* and *1959-60*, pp. 67; 24 and 27 and 34-37 respectively.

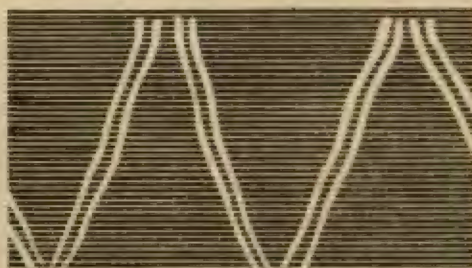






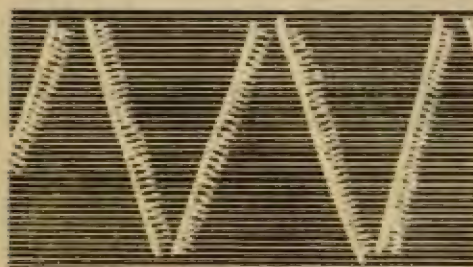












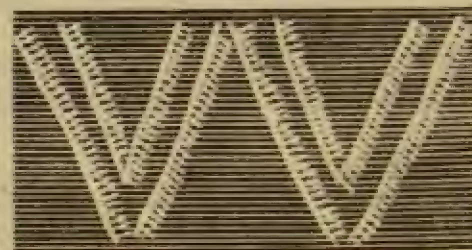
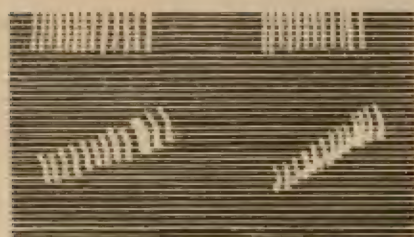
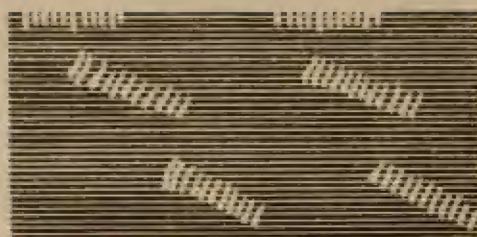
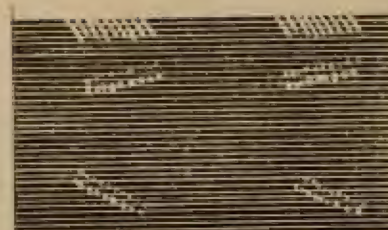


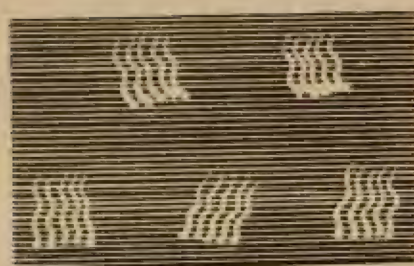
FIG. 3. *Design-elements on the white-painted black-and-grey ware, Period I*



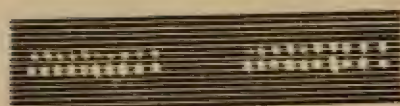












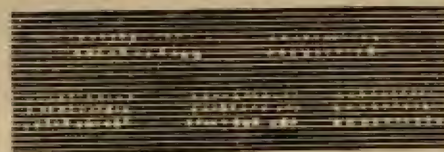








FIG. 4. *Design-elements on the white-painted black-and-grey ware, Period I*

H. Vertically-inclined short strokes in groups of twelve or thirteen each, combined with obliquely-inclined inverted comma-like strokes; painted respectively on the inner curve of the rim and on the shoulder-portion, often extending to the bulge.

J. Vertically-inclined short strokes in groups of eleven each, combined with obliquely running two rows of inverted comma-like strokes in groups of eleven or twelve; painted respectively on the inner curve of the rim and on the neck- and shoulder-portion.

K. Vertically-inclined short strokes in groups of seven each, combined with horizontal rows of dots in groups of nine each and obliquely-inclined inverted comma-like strokes in groups of seven each; painted respectively on the inner curve of the rim and on the neck- and shoulder-portion.

L. Obliquely-inclined short strokes in groups of nine each, combined with almost horizontal and obliquely-inclined double rows of dots in groups of nine to ten each; painted respectively on the inner curve of the rim and on the neck- and shoulder-portion.

M. Obliquely-inclined short wavy lines in groups of five each; painted on the inner bulge.

N. Obliquely-inclined double rows of dots or short dashes in groups of twelve each; painted on the inner side of the neck and the bulge.

P. Horizontal double rows of dots in groups of ten each; painted on the inner side of the neck.

Q. Obliquely-inclined four rows of dots in groups of nine to ten each; painted on the inner bulge.

R. Horizontal double and treble rows of dots in groups of eleven each; painted on the inner side of the neck and the bulge.

S. Horizontal fern-like design; painted on the lower portion of the inner surface.

T. Horizontal rows of herring-bones in groups of ten each; painted on the inner side of the neck.

The following represent the select types.

Fig. 5; pl. XII A

1. Spheroid deep bowl of black-and-grey ware with an out-turned featureless rim and convex sides. It is painted in white on the inside with a row of inverted comma-like strokes. The illustrated example is of medium fabric, has burnt black inside and black-and-grey outside with black towards the upper portion, and shows a burnished surface. From an early level of Period I. *Variant 1a*, of tan ware, with a slightly out-curved rim, is painted with horizontal rows of dots combined with obliquely-inclined rows in groups, a variant of pattern L (fig. 4). The illustrated example is of finer fabric and is burnished both externally and internally. From the earliest level of the Period. *Variant 1b*, of black-and-pale-grey ware, has an ovoid body and is painted with pattern H (fig. 4). From surface-collection. *Variant 1c*, of the same fabric as above, differs from the above in having a thinned rim. The illustrated example is painted on the inside with pattern N (fig. 4). From the earliest level of the Period. *Variant 1d*, of black-and-grey ware, differs from the above in having pronounced shoulders. The illustrated example is painted on the inside with pattern N (fig. 4). From a mid-level of the Period. *Variant 1e*, of similar fabric but showing an unoxidized portion of the core towards the inner surface, has the rim-portion less out-turned. The illustrated example is painted on the inner side with pattern R (fig. 4). From the earliest level of the Period. *Variant 1f*, of similar fabric as above, shows a thinned rim and almost cylindrical sides thickened at the junction of the shoulder. The illustrated example is painted on the inner side of the neck with a variant of pattern N (fig. 4). From a late level of the Period.

2. Spheroid deep bowl of black-and-pale-grey ware with pronouncedly out-turned or splayed-out rim, concave neck and seemingly rounded body. The illustrated example is painted on the inside with pattern H (fig. 4). Of medium fabric, it has burnt pale-yellow and black outside and greyish black on the inside and is burnished both internally and externally. From a mid-level of Period I. *Variant 2a*, of similar fabric, differs from the main type in having a less out-turned rim and slightly straighter sides. The illustrated example is painted on the inner side of the neck with pattern P (fig. 4). From an early level of the Period. *Variant 2b*, of similar fabric as above, has a slightly splayed-out rim making a wider angle with the ovoid body. The illustrated example is painted on the inner bulge with horizontal rows of strokes like inverted commas. From a mid-level

of the Period. *Variant 2c*, of similar fabric as above, differs from the above in the angle of the rim and in having convex sides. The illustrated example is painted on the inner bulge with an incomplete design consisting of a group of curved lines. From a mid-level of the Period. *Variant 2d* differs from the main type in having a carination at the neck-point. The illustrated example is painted on the inner side of the neck with pattern P (fig. 4). Of medium fabric, it is yellow red outside and black inside and shows unoxidized part of the core towards the inner side. From a mid-level of the Period. *Variant 2e*, of the same fabric as above, differs from *2a* in the curvature of the rim. The illustrated example is painted on the inner side of the neck with obliquely-inclined double rows of dots. From an early level of the Period.

3. Spheroid deep bowl of black-and-grey ware with a slightly-everted sharpened rim and rounded sides. The illustrated example is painted on the inner side with pattern N (fig. 4). Of medium fabric, it shows a darkened unoxidized portion of the core and a burnished surface. From an early level of Period I.

4. Wide-mouthed vase of black-and-grey ware with an out-turned featureless rim and convex thicker sides. The illustrated example is painted on the inner side of the neck with pattern T (fig. 4). Of medium fabric, it shows a burnished surface both inside and outside. From an early level of Period I.

5. Wide-mouthed vase of black-and-grey ware with a slightly out-curved featureless rim and thickened sides tending to be convex. The illustrated example is painted on the inner side with a variant of pattern L (fig. 4). Of medium fabric, it is burnished both inside and outside.

6. *Loṭā*-shaped vase of grey ware with an out-turned featureless rim and an ovoid body. The illustrated example is painted both on the outside and the inside with pattern E (fig. 3), besides having a graffito on the lower part of the body (Fig. 19, *1*). Of medium fabric, it is burnished only on the outside. From a mid-level of Period I. Also pl. XII A.

7. Vase of pale-grey ware with an out-turned rim and oblique shoulders. The illustrated example is painted both on the outside and the inside with pattern D (fig. 3). In addition, it shows a graffito resembling a trident-like plant on the outside (fig. 19, *2*). The illustrated example is of medium fabric, shows an unoxidized portion of the core towards the inner side and is burnished. From an early level of Period I.

8. Vase of grey ware with pronouncedly out-turned rim, oblique shoulders and a sharply-carinated profile. The illustrated example is of medium fabric and shows an unoxidized part of the core towards the inner side. From a late level of Period I.

9. Vase of black-and-grey ware with an out-turned rim, cylindrical long neck and a ledged shoulder. The illustrated example is painted both on the outside and the inside with pattern G (fig. 3). Of comparatively fine fabric, it seems to be uniformly fired. From a late level of Period I. *Variant 9a*, of the same fabric as above, differs from the above in being plain and having a slight curvature of the rim. The illustrated example is from an early level of the Period. *Variant 9b*, of black-and-grey ware, has a more pronounced ledge at the shoulder and a rounded body. The illustrated example has burnt fully black in the section. From an early level of the Period. *Variant 9c*, of black-and-grey ware, is a diminutive example with a slightly thinned rim and thicker body. The illustrated example is from a late level of the Period. *Variant 9d* differs from the preceding in having a concave neck and rounded body. The illustrated example is of medium fabric which has burnt black in the section and is burnished on the upper portion both externally and internally. From a mid-level of the Period. *Variant 9e*, of black-and-grey ware, differs from the preceding in having a low girth and flattish base. The illustrated example is of medium fabric, has burnt completely black in the section and shows no burnishings. From a late level of the Period. *Variant 9f*, of black-and-grey ware, differs from *9a* in having a more pronounced out-turn of the rim and a shorter neck. The illustrated example is painted on the inside of the neck with obliquely-inclined groups of short dashes. Of medium fabric, it is burnished both externally and internally. From an early level of the Period. *Variant 9g*, of tan ware, has a marked turning of the rim. The illustrated example is of comparatively fine fabric with a fully-oxidized core and is burnished both on the outside and the inside. From an early level of the Period. *Variant 9h*, of black-and-grey ware, differs from the above in the length of the rim-portion. The illustrated example is painted both on



FIG. 5. *Pottery from Period I: white-painted black-and-grey ware including plain grey variety*

the outside and the inside with pattern E (fig. 3). Of medium fabric which has burnt black in the section, it is burnished both externally and internally. From a late level of the Period.

10. Bowl of black-and-red ware of the Ahar fabric with an everted rim and convex sides. The illustrated example is painted on the outside with a zigzag line, in pattern C (fig. 3). Of medium fabric which has burnt uniformly black in the section, it is burnished both externally and internally and comes from the earliest level of Period I. Similar examples are reported from some explored sites in Rajasthan.[1]

(ii) *The black-painted red pottery of the Malwa Ware*

This ware, alternatively designated the Malwa Painted Red Ware,[2] has sprung into importance and acquired definition as a result of recent explorations and excavations in central and western India. The present-day distribution of this ware covers the basins of the Chambal, Narmada, Tapti and Godavari between 25° and 19° N. parallels and 73° and 76° E. longitudes (fig. 6). Besides, a cognate painted ware has also been reported from Eran in Sagar and Tripuri in Jabalpur Districts. In view of the regional variations or ramifications showing differences in ground colour or rendition, a more generic name is adopted here. The ware is made on wheel and is invariably dressed with an orange-red slip, mostly in the nature of a ' self-slip ' on the outside, and in case of dishes, often both on the outside and the inside. The paste is orange-buff but tends to deeper shades in some cases. The texture is dense showing sparse to medium concentration of the inclusions, comprising finer minerals and gives a straight but rough fracture. The ware is hard-fired and shows a uniformly-oxidized crore, occasionally showing a blotchy surface.

On the slipped surface are painted linear designs in a thin purplish to brown-black pigment; the red background, however, predominates. The designs (fig. 7) present considerable variety. In addition to such very simple decorations as single or multiple bands around the shoulder or neck, there also occur elaborate designs employing geometric motifs in repeat pattern, bordered above and below by horizontal bands, separating the painted area into panels or registers. These include: a medley of loops: rayed joined volutes; rows of criss-cross hatched or latticed diamonds; triangles, pendant or upright; grouped wavy lines, horizontally and vertically disposed; grouped converging lines- concentric circles; chequer-board or diaper; and chevrons, composed of latticed or ladder hatched lines. The designs are painted on the upper part of the body and invariably above the maximum width. The syntax of the design-element does not show any originality and gives the impression of an artificial revival. In addition to the geometric, representational motifs displaying animals like the spotted deer, crane and stylized peacock, used as fillers (fig. 12; pl. XV), are also depicted. Such a repertoire, however, must have been borrowed from the more ancient cultures in Iran, although the present evidence is not sufficient enough to indicate the ancestry or the inheritance. It is noteworthy that only wild or predomestic animals were portrayed at a time when hunting was of minimal importance.

The designs were painted with a medium brush. The use of the multiple brush for rendering grouped wavy lines is also attested. The decoration as a rule was rendered in a free, bold style quite unlike the over-refined and self-disciplined art of the Harappa pottery with which it shows only vague relationship.

The commonest shapes represented in this ware include: the vase with vertical neck and globular body (fig. 8, *1-4*); the vase with out-turned or out-curved rim (fig. 8, *15-17*) and *19*); the jar with clubbed or collared rim (fig. 9, *22-27*); the bowl with slightly everted

[1] *Indian Archaeology* 1956-57—*A Review* (1957), p. 8, fig. 3, *6*.
[2] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 85.

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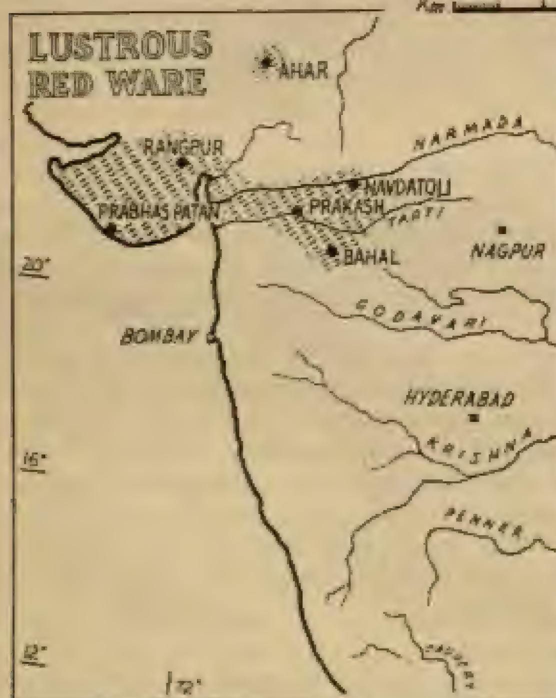




Fig. 6
(Add Chandoli as a Lustrous Red Ware site.)

rim (fig. 8, *18*); and the dish and dish-on-stand (fig. 9, *28-34*). Amongst these, only the dish-on-stand shows a significant likeness to the corresponding Harappan form. The jar with a thickened rim (fig. 9, *23*) is another type, although the similarity is only elementary. Quite a large number of resemblances, however, are available with pottery of the comparable period at Maheshwar and Navdatoli, Bahal, Daimabad, Chandoli, Nagda, Rangpur II C and III and Lothal B. In the painted designs, besides the ubiquitous horizontal bands, AA, AD, patterns D, F, G, H, J, M, R and V are paralleled at Maheshwar in Period III;[1] G, L and M at Bahal-Tekwada;[2] G, H, J, L and W at Daimabad;[3] C, F, G, R and V at Nagda;[4] and L at Nevasa.[5] Variants of B and C, D, F, G, L and V occur at Lothal B[6] and B-D and L at Rangpur II C and III.[7] Carbon-14 determinations from the relevant strata at Navdatoli, Nevasa, Chandoli and Eran indicate a range broadly between 1700 and 1000 B.C. for this ware (above, pp. 19-22; fig. 2 and below, pp. 154-60).

This ware makes up more than half the pottery classified from Period I. Vertically, its distribution is not homogeneous and shows variation. From 43·6 per cent in the lowest level, it rises to 71·98 per cent in layer 50 and thereafter maintains an average between 60 to 55 per cent. This lack of homogeneity obviously results from the influence of other industries.

The design-elements are listed below.

FIG. 7

A. Grouped wavy lines, bordered above by a band; painted on the inner lip of dishes; use of a multiple brush attested.

B. Intersecting loops, bordered above by a band and with regularly-spaced wavy lines in groups of two each emanating from the lower ends of the loops; painted respectively on the inner lip and side of dishes.

C. Double loops, bordered above and below by bands and with regularly-spaced single wavy lines emanating from the lower band; painted respectively on the inner lip and side of the dishes.

D. Regularly-spaced short strokes in groups of ten each, bordered by a thick band; painted on the inner lip of vases or dishes.

E. Regularly-spaced loops in groups of three each, bordered by a band; painted on the inner lip of vases.

F. Rows of latticed diamonds, bordered above and below by horizontal bands; painted on the upper part of the body of vases.

G. Rows of latticed diamonds, panelled by horizontal bands separating each row and bordered by a thick rim-band; field of decoration same as F above.

H. Regularly-spaced zigzag lines in groups of two each, bordered above and below by horizontal bands; painted on the shoulder-part of the vases or walls of the bowls. The pattern is very common on the Jorwe Ware.[8]

J. Latticed upright triangles, bordered above and below by horizontal bands; field of decoration same as above.

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[1] Sankalia, Subbarao and Deo, *op. cit.* (1958), pp. 83-127.

[2] *Indian Archaeology, 1956-57*, pl. XXA, *1* and *3* and fig. 8, *5*.

[3] *Ibid. 1958-59*, pl. XXIIIB, *15, 2, 9* and *18* and *16* respectively.

[4] *Ibid., 1955-56*, pp. 11-18, and fig. 5, *7*.

[5] Sankalia, Deo, Ansari, Ehrhardt, *op. cit.* (1960), fig. 108, *XXVIII*.

[6] Information from Shri S. R. Rao.

[7] *Indian Archaeology, 1954-55*, pl. XI A.

[8] Sankalia and Deo, *op. cit.* (1955), fig. 81, *2, 3, 7* and *10*; also Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), fig. 112, *1*.

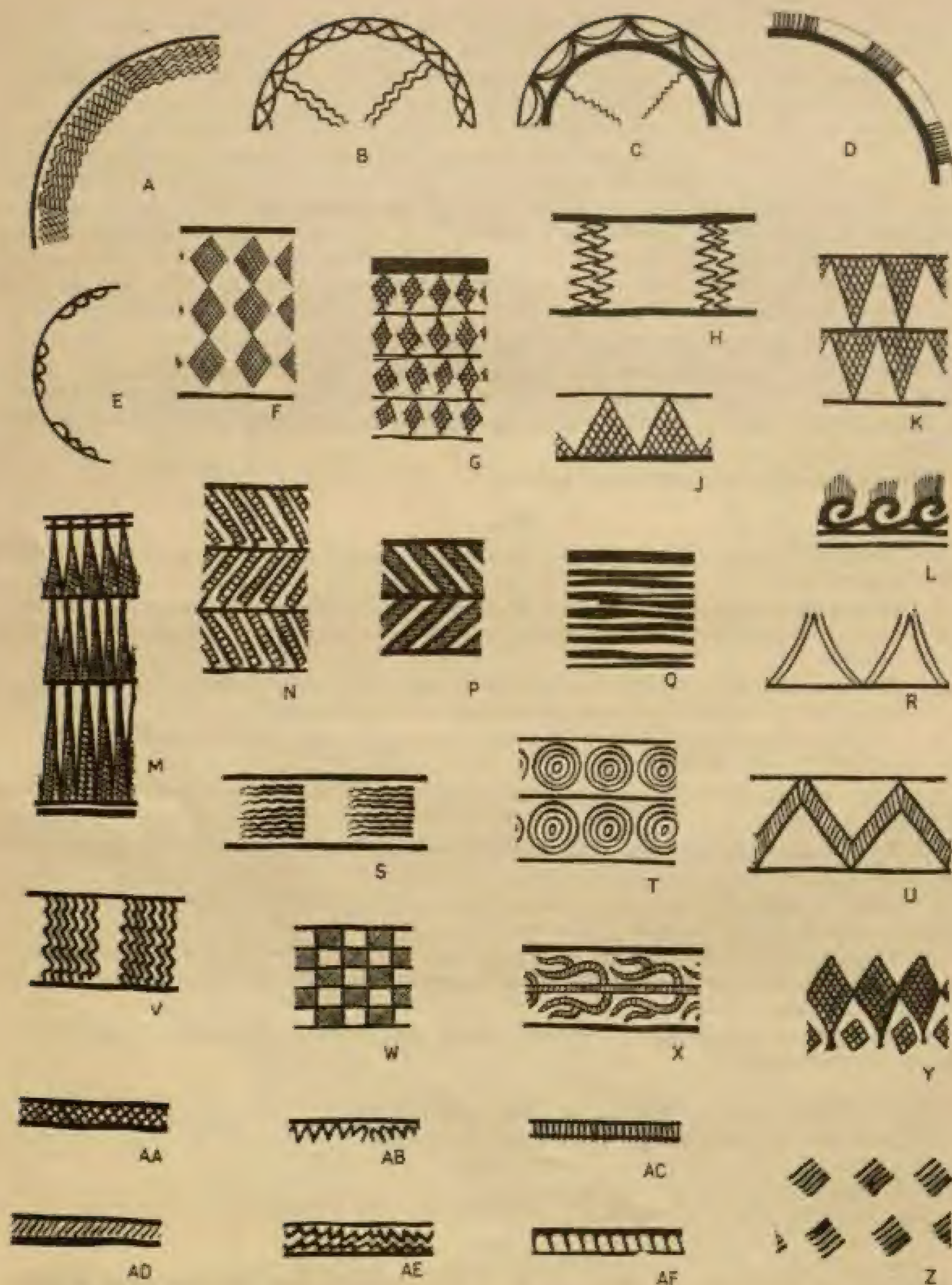


FIG. 7. *Design-elements on the black-painted red pottery of the Malwa Ware, Period I*

K. Rows of latticed pendant-triangles, panelled by horizontal bands; field of decoration same as G above.

L. Row of rayed volutes, bordered below by horizontal bands; painted on the shoulder part of vases. This design gets stylized in the Jorwe Ware.[1]

M. Rows of latticed triangles, panelled by horizontal bands and bordered above and below by an additional band; each row covers respectively neck, shoulder and body of the vase.

N. Rows of oblique bands in ladder-pattern meeting to form a chevron, panelled by horizontal bands; field of decoration same as M above.

P. Rows of oblique latticed bands meeting to form a chevron, panelled by horizontal thick bands; field of decoration same as G above.

Q. Multiple bands of varying thickness showing in one case the start of the paint-brush; painted on the neck extending to the rim-portion of vases.

R. Converging lines in groups of two each, bordered below by a horizontal band; painted on the neck-portion of vases.

S. Horizontal row of wavy lines in groups of eight each, bordered above and below by horizontal bands; painted on the shoulder-part of vases.

T. Rows of concentric circles, panelled by horizontal bands; painted on the shoulder extending to the belly-portion of vases.

U. Pyramids of ladder-pattern, bordered above and below by horizontal bands; painted on the neck-portion of vases.

V. Vertical wavy lines in groups of six each, bordered above and below by horizontal bands; painted on the shoulder extending to the neck-portion of vases.

W. Chequer-board or diaper; painted on the shoulder extending to the belly-portion of vases.

X. Stylized tines of the antler; painted on the shoulder-portion of vases.

Y. Rows of latticed diamonds alternating with smaller-sized diamonds placed as fillers; field of decoration same as perhaps W above.

Z. Rows of diamond-shaped short oblique strokes in groups of five each; field of decoration same as Y above.

AA. Band showing criss-cross design.

AB. Band showing zigzags, bordered above by a horizontal band.

AC. Band showing ladder-pattern.

AD. Band showing oblique strokes, bordered above and below by thicker horizontal bands.

AE. Band showing double row of zigzags, bordered above and below by horizontal bands.

AF. Band showing continuous arches.

The following represent the select types.

Figs. 8 and 9; pl. XII B

1. Vase of yellow-red ware with an out-turned featureless rim, vertical neck and globular body. The illustrated example is painted in purplish black on the outside with pattern M (fig. 7). Of medium fabric showing fully-oxidized core, it seems to have been wet-smoothed. From a mid-level of Period I. Also Pl. XII B.

2. Fragment of a vase of red ware showing an out-turned thickened rim and part of the neck. The illustrated example is painted in black on the outside with pattern Q (fig. 7); the bands, however, seem to be carefully ruled. Of medium fabric showing an oxidized core, it is treated externally with

[1]Sankalia and Deo, *op. cit.* (1955), fig. 82, *3, 5*, and *6*, and Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), fig. 108, *XI*.

a thin red slip. From a mid-level of Period I. *Variant 2a*, of the same fabric as above, differs in having an out-curved and slightly undercut rim. The illustrated example is from an early level of Period I. *Variant 2b*, of the same fabric as above, shows a long cylindrical neck with irregularly-painted bands. The illustrated example is from a mid-level of Period I.

3. Fragment of a vase of red ware with a featureless rim and long concave neck. The illustrated example is painted in purplish black on the outside with pattern N (fig. 7). Of medium fabric showing an oxidized core, it seems to have been wet-smoothed during potting. From a late level of Period I. *Variant 3a*, of the same fabric as above, differs in having a sharply out-turned rim. The illustrated example, painted on the outside with the same pattern as the main type, shows an additional rim-band on the inner lip. From a late level of Period I.

4. Fragment of a vase of red ware with an out-turned beaded rim and a vertical neck. The illustrated example is painted in black on the outside with horizontal bands on the rim and at the junction of the shoulder, and on the inside with a band on the lip. Of comparatively fine fabric showing a fully-oxidized core, it is treated with a thin red slip. From a mid-level of Period I.

5. Rim-fragment of a vase of red ware with a vertical externally-beaded rim and cylindrical neck. The illustrated example is painted in black on the outside with pattern *G* (fig. 7). Of medium fabric showing an oxidized core, it is treated externally with a red slip. From surface-collection.

6. Rim-fragment of a vase of red ware with an out-curved beaded rim and concave neck. The illustrated example is painted in black on the outside with a horizontal band at mid-height of the neck. Of medium fabric showing an oxidized core, it seems to be wet-smoothed while potting. From a mid-level of Period I.

7. Rim-fragment of a vase of red ware with an out-curved nail-head rim. The illustrated example is painted in thin black on the outside with horizontal bands. Of comparatively fine fabric showing an oxidized core, it is treated externally with a red slip. From a mid-level of Period I.

8. Rim-fragment of a vase of drab-red ware showing a clubbed rim. The illustrated example is painted in purplish black on the outside with vertical ladder-pattern. Of medium fabric showing an oxidized core, it seems to be wet-smoothed during potting. From a mid-level of Period I.

9. Vase of red ware with a vertical thinned rim, short concave neck and globular body. The illustrated example is painted in black on the outside with a band of pattern AC. Of medium fabric showing an oxidized core, it is treated externally with a red slip. From a late level of Period I.

10. Fragment of a vase of pale-red ware showing an out-curved featureless rim and concave neck. The illustrated example is painted in black on the outside with pattern R (fig. 7). Of comparatively fine fabric, it seems to be wet-smoothed externally. From a mid-level of Period I. Also pl. XIII, *8*.

11. Fragment of a perforated vase. The illustrated example is painted on the outside with horizontal bands. Of medium fabric showing an oxidized core, it seems to be wet-smoothed externally. From a mid-level of Period I.

12. Rim-fragment of a vase with an out-curved featureless rim. The illustrated example is painted on the outside with loops above a border and on the inside with Pattern E (fig. 7). Of medium fabric showing an oxidized core, it is treated both externally and internally with a slip. From a late level of Period I.

13. Fragment of a vase showing an everted rim and expanding shoulders. The illustrated example is painted in black on the outside with a broad band of criss-cross pattern and on the inside with a rim-band. Of comparatively fine fabric showing an oxidized core, it is treated on the outside with a slip. From a late level of Period I.

14. Fragment of a vase of red ware with an out-curved thickened rim. The illustrated example is painted in black on the inner lip with intersecting loops, a variant of pattern B (fig. 7). Of medium fabric showing an oxidized core, it is treated externally with a thin sloshy wash. From an early level of Period I.

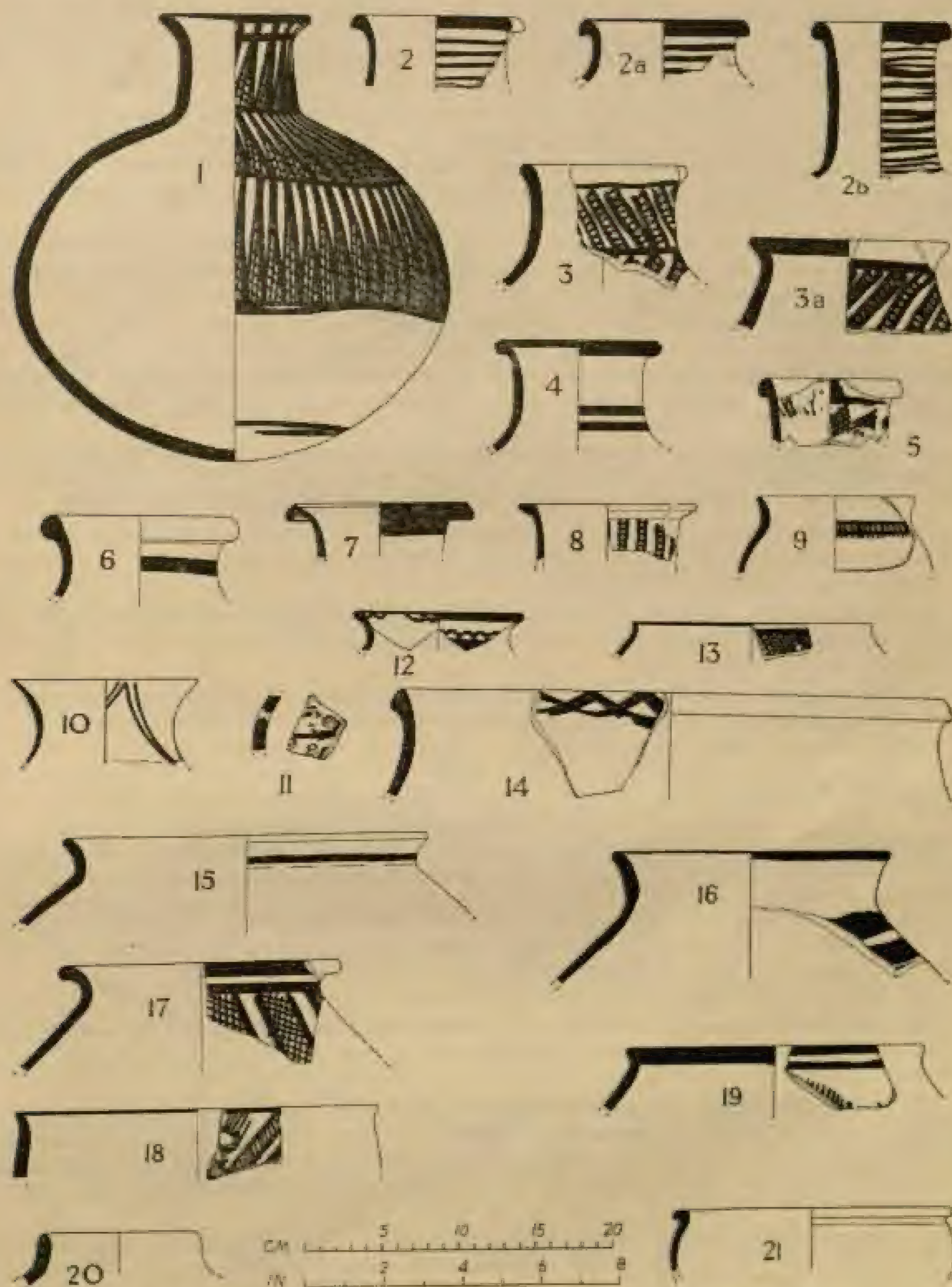


FIG. 8. *Pottery from Period I: black-painted red pottery of the Malwa Ware*

15. Vase of red ware with an out-turned featureless rim, short concave neck and oblique shoulders. The illustrated example is painted in black on the outside with a horizontal band immediately below the rim. Of medium fabric showing an oxidized core, it is wet-smoothed. From the same level as type *13* above.

16. Vase of red ware with an out-turned featureless rim, concave neck and oblique shoulders. The illustrated example is painted in purplish black on the outside with horizontal bands on the rim and shoulders, the latter being thicker and irregular, and on the inside with a rim-band. Of medium fabric showing an oxidized core, it is devoid of any surface-treatment. From a late level of Period I.

17. Vase of red ware with an out-curved thickened rim, short concave neck and oblique shoulders. The illustrated example is painted in black on the outside presumably with pattern P (fig. 7), in addition to the rim-band. Of comparatively finer fabric showing an oxidized core, it is treated externally with a red slip. From surface-collection.

18. Bowl of red ware with an everted featureless rim and straight sides. The illustrated example is painted in thin black on the outside with an incomplete design, one element of which seems to be pattern U (fig. 7) with indeterminate fillers in open spaces. Of medium fabric showing an oxidized core, it seems to be wet-smoothed on the outside. From a mid-level of Period I.

19. Vase of red ware with a short out-turned rim, bluntly-carinated neck and oblique shoulders. The illustrated example is painted in black on the outside with an indeterminate design besides the horizontal bands, and on the inside with a thick rim-band. From the latest level of Period I.

20. Vase of red ware with a vertical featureless rim. The illustrated example is treated in black on the outside with a thin slosh. Of medium fabric showing an oxidized core, it seems to be wet-smoothed on the outside. From a late level of Period I.

21. Spheroid bowl of red ware with a horizontally out-turned rim and rounded sides. The illustrated example is of medium fabric showing an oxidized core and seems to be wet-smoothed. From the latest level of Period I.

22. Wide-mouthed jar of red ware with an out-turned short rim sitting immediately over a spheroid body. The illustrated example is painted in thin black on the outside with a rim-band, and on the inside with a variant of pattern D (fig. 7). Of medium fabric showing an oxidized core, it is dressed externally with a thin red slip. From a mid-level of Period. I. *Variant 22a*, of the same fabric as above, differs in having a nail-head rim. The illustrated example is painted on the lip with a variant of pattern D (fig. 7). From the latest level of Period I.

23. Jar of red ware with a vertical thickened rim and oblique shoulders. The illustrated example is painted in black on the outside with a horizontal band intersected by oblique lines, the design being incomplete. Of medium fabric showing unoxidized part of the core in mid-sections, it is treated externally with a red slip. From a mid-level of Period I. *Variant 23a* differs from the above in having a beaded rim. The illustrated example is painted in black on the outside with an incomplete design. From the same level as above.

24. Vase of red ware with a vertical elliptical-collared rim sitting immediately over the body. The illustrated example is painted in black on the outside with horizontal bands. Of medium fabric showing an oxidized core, it is treated externally with a thin red slip. From a mid-level of Period I.

25. Jar of red ware with a vertical elliptical-collared rim and a long concave neck. The illustrated example is painted in black on the outside with horizontal bands, the one on the collar being thickly spread, and with an incomplete design showing oblique rows of dots. Of medium fabric showing unoxidized parts of the core in mid-sections, it is treated externally with a red slip. From a mid-level of Period I.

26. Jar of red ware with a vertical collared rim and long oblique shoulders. The illustrated example is painted in black on the outside with thickly-spread horizontal bands, and on the inner lip with a variant of pattern D (fig. 7). Of medium fabric showing oxidized core, it is treated externally with a red slip. From a mid-level of Period I.



FIG. 9. *Pottery from Period I: black-painted red pottery of the Malwa Ware*

27. Jar of red ware with an out-turned collared rim and oblique shoulders. The illustrated example is painted in black on the outside with a thick rim-band over pattern V (fig. 7), rendered by a multiple brush. Of medium fabric showing an oxidized core, it is treated externally with a red slip. From an early level of Period I.

28. Shallow dish with a nail-head rim. The illustrated example is painted in thin purplish black on the inner lip with multiple wavy lines of pattern A(fig. 7), rendered by a multiple brush, and on the outside with a thick band on the rim. Of comparatively fine fabric showing an oxidized core, it is treated both externally and internally with a red slip. From an early level of Period I.

29. Shallow dish of red ware with an out-turned internally-collared rim. The illustrated example is painted in black on the inner lip with a variant of pattern D (fig. 7), and on the outside with a rim-band. Of medium fabric showing an oxidized core, it is treated both externally and internally with a red slip. From a late level of Period I.

30. Dish of red ware with an out-turned featureless rim, sharply carinated at the junction with the body. The bottom part shows traces of luting with the stem or the stand. The illustrated example is painted in thin black on the inside with pattern B (fig. 7). Of medium fabric showing an oxidized core, it seems to be wet-smoothed. From a pit ascribable to the earliest level of Period I.

31. Shallow dish of red ware with an out-turned short rim sharply carinated at the junction with the body. The illustrated example is painted in black on the inside with pattern B (fig. 7); the wavy lines emanating from the loop as in the main design, however, are missing. Of medium fabric showing an oxidized core, it is treated on the inside with a red slip. From a late level of Period I.

32. Shallow dish with an externally-beaded rim. The illustrated example is painted in black on the inside with pattern C. Of medium fabric showing an oxidized core, it is treated both externally and internally with a red slip and is further characterized by an incomplete graffito on the outside (fig. 19, *7*). From a late level of Period I.

33. Stem of a dish-on-stand. The illustrated example is painted in black with horizontal bands. Of medium fabric showing oxidized core, it is treated externally with a thin red slip. From a mid-level of Period I.

34. Lower part of a dish-on-stand showing a clubbed rim-base. The illustrated example is painted in black on the outside with a horizontal band. Of a comparatively fine fabric showing an oxidized core and smoothed surface, it is treated both on the outside and inside with a red slip. From the same level as type 30 above.

The following series represent the range of designs met with in this ware. The design-elements shown in fig. 7 are mostly reconstructed from these sherds which, however, are illustrated here to relate the deisgn to the respective field of decoration and the form. Besides, some sherds showing incomplete designs have also been included to afford possibilities of comparison with unpublished material from other sites. To avoid repetition, sherds illustrated on pls. XIII and XIV have not been separately described but are indicated against the respective numbers: *2* to *6*, *9*, *10*, *12*, *13*, *15* *16*, *19* to *25* and *27* to *30* of figs. 10 and 11 and *10* of fig. 8.

Figs. 10 and 11; pls. XIII and XIV

1. Shoulder-portion of a vase of red ware, painted in black on the outside with a variant of pattern H (fig. 7). From surface-collection.

2. Shoulder-portion of a vase of red ware, painted in thin purplish black on the outside with pattern X (fig. 7). From the latest level of Period I. Also pl. XV, *8*.

3. Upper part of a vase of red ware, painted in black on the outside with pattern V (fig. 7). From a mid-level of Period I. A better depiction of the pattern is seen in the sherd illustrated on pl. XIII, *12*.

4. Upper part of a vase of red ware, painted in black on the outside with a variant of pattern V (fig. 7). From a late level of Period I. Also pl. XIII, *11*.



FIG. 10. *Pottery from Period I: black-painted red pottery of the Malwa Ware*

5. Upper part of a vase of red ware, painted in black on the outside with a band of pattern AB (fig. 7) below the neck and rayed volutes of pattern L (fig. 7) on the shoulder. From surface-collection. Also pl. XIII, *3.*

6. Upper part of a vase of red ware, painted in black on the outside with pattern L (fig. 7). From a late level of Period I. Also pl. XIII, *4.*

7. Belly-part of a vase of red ware, painted in black on the outside with a variant of pattern G (fig. 7). From a mid-level of Period I.

8. Neck-part of a vase of red ware, painted in black on the outside with pattern G (fig. 7). Some of the sherds show latticed diamonds of five strokes. From a late level of Period I.

9. Upper part of a vase of red ware, painted in black on the outside with pattern F (fig. 7). From an early level of Period I. Also pl. XIII, *9.*

10. Fragment of a vase of red ware, painted in black on the outside with pattern J (fig. 7). From a late level of Period I. Also pl. XIII, *5.*

11. Fragment of a vase of red ware, painted in black on the outside with pattern K (fig. 7). From the same level as 10.

12. Fragment of a vase of red ware, painted in black on the outside with pattern J (fig. 7). From an early level of Period I. Also pl. XIV, *18.*

13. Fragment of an upper part of a vase of red ware, painted in purplish black on the outside with a criss-cross band below an indeterminate design. From a mid-level of Period I. Closer-spaced criss-cross bands are also available as illustrated on pl. XIV, *20.*

14. Shoulder-part of a vase of red ware, painted in thin black with a row of latticed lozenges of pattern Y (fig. 7). From surface-collection.

15. Shoulder-part of a vase of red ware, painted in black on the outside with alternating bands of patterns AA and AF above traces of pattern G (fig. 7). From surface-collection. Also pl. XIV, *13.*

16. Shoulder-part of a vase of red ware, painted in black on the outside with alternating bands of patterns AA and AE (fig. 7). From an early level of Period I. Also pl. XIV, *15.*

17. Shoulder-part of a vase of red ware, painted in black on the outside with bands of pattern AE (fig. 7). From the latest level of Period I.

18. Upper part of a vase of red ware, painted in black on the outside with an incomplete design showing pellet-ended lines, bordered by horizontal bands. From an early level of Period I.

19. Upper part of a vase of red ware, painted in black on the outside with three bands of pattern AD above traces of pattern K (fig. 7). From an early level of Period I. Also pl. XIV, *14.*

20. Upper part of a vase of red ware, painted in black on the outside with pattern T (fig. 7). From a mid-level of Period I. Also pl. XIII, *1.*

21. Upper part of a vase of red ware, painted in black on the outside with an incomplete design comprising latticed diamonds topped by horizontal short strokes, used as a filler perhaps for pattern H (fig. 7). From a late level of Priod I. Also pl. XIII, *7.*

22. Upper part of a vase of red ware, painted in purplish black on the outside with pattern W (fig. 7). From a mid-level of Period I. Also pl. XIII, *10.*

23. Belly-part of a vase of red ware, painted in black on the outside with pattern Z (fig. 7). From the same level as above. Also pl. XIV, *21.*

24. Upper part of a vase of red ware, painted in black with an incomplete design of joined volute-like pattern. From a late level of period I. Also pl. XIV, *22.*

25. Shoulder-part of a vase of red ware, painted in black on the outside with pattern T (fig. 7). From an early level of Period I. Also pl. XIII, *6.*

26-27. Fragments of a vase of greyish drab ware, painted in purplish black on the outside with an incomplete design formed by three bands of ladder-pattern terminating in a spiral manner. Pellet-ended radiating lines are used as a filler. From a mid-level of Period I. Also pl. XIV, *17.*

28. Upper part of a vase of red ware, painted in black with an incomplete design resembling that on *27* above. From a late level of Period I. Also pl. XIII, *2.*



Fig. 11. *Pottery from Period I: black-painted red pottery of the Malwa Ware*

29. Fragment of a vase of red ware, painted in black on the upper part of the outside with pattern P (fig. 7). From surface-collection. Also pl. XIV, *16.*

30. Belly-part of a vase of red ware, painted in black on the upper part of the outside with pattern S (fig. 7). From an early level of Period I. Also pl. XIV, *19.*

The following sherds illustrate the animal-motifs occurring on the black-painted red ware at Prakash. Most of these, however, portray the *cervidae* family of the deer (Cervus genus) with a spotted body and long branching antlers with tines.[1] The spotted deer are normally gregarious. Such a portrayal is shown in jungle-scenes as in fig. 12, *5* below. The depiction of the animal is often stylized. The deer on the corresponding ware at Nagda show a spotted body but differ in having spiral-horns like those of the black buck.

Fig. 12; pl. XV

1. Shoulder-part of a vase of red ware, painted in black on the outside with a spotted deer with its face turned backwards. The head-part is missing. The motif is panelled by horizontal bands. From surface-collection. Similar disposition of the neck of the animal is seen on one of the graceful

[1] Frank Finn, *Sterndale's Mammalia of India* (Calcutta and Simla, 1929), pp. 252-54.

goblets at Lothal[1] and on a deep bowl from the necropole B at Sialk.[2] Apart from the similarity of posture, the comparison need not be overemphasized.

2. Shoulder-part of a vase of red ware, painted in black on the outside with a spotted deer showing stylized neck and ears and one beam of the antler with brow-tine and brez-tine. From a mid-level of Period I.

3. Upper part of a vase of light-red ware, painted in light-black on the outside with the hind legs of a stylized deer, and stylized peacocks used as fillers, reconstructed from similar depiction at Daimabad.[3] From a mid-level of Period I.

4. Fragment of the belly-part of a vase, painted in black on the outside with a carnivorous animal, possibly of the *feline* genus. From a late level of Period I.



FIG. 12. *Animal motifs on the black-painted red ware, Period I*

5. Upper part of a vase of red ware, painted in black on the outside with a jungle-scene showing spotted deer, a crane and foliage. The antlers and the spotted bodies of the animals are clearly seen. The design is panelled at the base by two horizontal bands below which traces of latticed diamonds of pattern F or G (fig. 7) are seen. From an early level of Period I.

[1] *Indian Archaeology, 1957-58*, pl. XVII A.

[2] Claude F. A. Schaeffer, *Stratigraphie Comparée et Chronologie de l'Asie Occidentale* (*London, 1948*), fig. 252, *13*.

[3] *Indian Archaeology 1958-59*, p. 17 and fig. 8; pl. XXII B.

6. Mid-part of a vase of red ware, painted in black on the outside with an incomplete animal-design. From an early level of Period I.

7. Shoulder-part of a vase of red ware, painted in black on the outside with a stylized spotted deer in motion. From an early level of Period I.

8. Shoulder-part showing stylized tines of an antler. For illustration see fig. 10, *2*.

(iii) *The black-painted red pottery of the Jorwe Ware*

The pottery of this class, previously labelled 'Jorwe-Nevasa Painted Red Ware',[1] belongs to a separate but related tradition and takes its name after the site where it was first discovered.[2] Subsequently, it was found to occur at many sites in the Godavari and Pravara basins (fig. 6). Throughout made on a fast wheel, it shows uniformly-built thin walls with regularly parallel striations. The surface-colour ranges from drab through light-orange to shades of red. The surface is essentially mat, although examples of smoothed semi-gloss resulting from slip-dressing are not wanting. The texture of the paste employed is dense with sparse concentrations of the inclusions, comprising natural admixture of fine sand and minerals and produces an essentially straight but rough fracture. The Ware is hard fired to an extent that it often gives a metallic ring and shows fully-oxidized core-sections. In a few cases vitrification has also resulted from overfiring. In comparison, the hard-burnt fabric of this Ware is easily distinguishable from that of the Malwa (above, pp. 35-37).

The Ware is further characterized by a painted decoration consisting of linear designs employing simplest geometric repertoire, singularly monotonous in effect. These include (fig. 13): vertical or converging lines in groups; zigzags; wavy lines; criss-cross and running loops, forming latticed diamonds or upright triangles. Each element is panelled both above and below by horizontal bands. The decoration is confined to the portion above the girth and in some cases to the inner base of the bowls as well (fig. 14, *25* and *26*), the method of decoration being essentially zonal or tectonic in the sense that the structure of the vase is emphasized. Rim-bands, both on the outside and the inside, are a recurrent feature.

The designs are painted with a medium-to-fine brush, sometimes also employing a multiple brush. The decoration, though rendered in free-hand style, seems to be better drawn than that on the Malwa Ware.

The characteristic shapes of this Ware are very few indeed and include: the concave-sided carinated bowl or dish (fig. 14, *24*); the tubular spouted vase (fig. 24, *27*); and the plain high-necked globular vase (fig. 24, *28*). Each of these patent shapes is closely paralleled at Jorwe,[3] Nevasa[4] and Chandoli,[5] where it occurs throughout the chalcolithic period. The upper levels of the chalcolithic strata at Maheshwar (Phases III and IV) also yielded bowls and dishes of the same fabric. The spouted vessels were, however, missing there.[6] A single sherd of the same fabric was also reported from Ahar I B.[7]

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[1] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 85; also Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 205.

[2] Sankalia and Deo, *op. cit.* (1955), pp. 160 ff.

[3] *Ibid.*, figs. 61 to 67 and pl. XXXIV.

[4] Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), figs. 85-90.

[5] *Indian Archaeology* 1960-61 p. 27; also Deo and Ansari, *op. cit.*, pp. 56-94

[6] Sankalia, Subbarao and Deo, *op. cit.* (1958), pp. 85 and 86, fig. 15, *7. 19d* and *g*; also B. Subbarao, *The Personality of India* (second edition, Baroda, 1958), p. 110, fig. 30.

[7] Information from Dr. H. D. Sankalia.

Correspondence in design-elements is seen in patterns A, B, D, F and M at Jorwe, D, E, F, H, K, L, M, P and Q at Nevasa and D, F, L, M and Q at Maheshwar-Navdatoli. It will be seen that whereas patterns D, F and M are common to all the three sites, designs C, G, J and N are peculiar to Prakash alone. This brings us to the question of date. Carbon-14 determinations from the relevant strata at Navdatoli, Ahar, Nevasa and Chandoli indicate a range between *circa* 1600 to 1000 B.C. for this Ware (above, pp. 19-22; fig. 2 and below, pp. 154-60; TF-31, P-181, TF-40, P-472, P-473, P-474).

This Ware forms only a negligible 2·67 per cent of the classified pottery from Period I and is confined to the upper four layers of the corresponding strata, labelled Sub-period I B. Commencing with 4·54 per cent in layer 48, it rises to a sizable percentage of 14·93 in the top level of the Period, indicating a consistently increasing influence towards the close of the Period.

The design-elements are listed below.

Fig. 13

A. Vertical lines in groups of six each, panelled by horizontal bands; painted on the sides of bowls or shoulders of vases.

B. Converging lines in groups of three each, panelled by horizontal bands; field of decoration same as above.

C. Wavy lines in group, rendered by the employment of multiple brush technique; painted on the sides of the bowl.

D. Converging lines in groups of nine each, a variant of pattern B above but panelled below a rim-band; field of decoration same as above.

E. Stylized zigzags, separated by oblique lines in groups of six each, panelled above and below by horizontal bands; field of decoration same as above.

F. Stylized zigzags, panelled by horizontal bands, the lower one being thicker; field of decoration same as above.

G. Stylized zigzags, enclosed by horizontal bands and separated by vertical lines in groups of two each, panelled below a rim-band; field of decoration same as above.

H. Zigzags, enclosed by horizontal bands, panelled below a rim-band; field of decoration same as above.

J. Latticed diamonds, formed by continuous loops and panelled by horizontal bands; field of decoration same as above.

K. Latticed diamonds, formed as above but panelled in addition by vertical lines flanking open triangles; field of decoration same as above.

L. Double loops, panelled by horizontal bands below a rim-band; field of decoration same as above.

M. Band of criss-cross pattern below a rim-band; field of decoration same as above.

N. Criss-cross blocks alternating with empty rectangles separated by vertical lines and panelled by horizontal bands below a rim-band; field of decoration same as above.

P. Latticed diamonds, flanked on either side by empty triangles and vertical lines in groups of eight each, panelled by horizontal bands below a rim-band; field of decoration same as above.

Q. Latticed triangles, formed by running loops and panelled by horizontal bands; field of decoration same as above.

The following represent the select types. Reference to the sherds illustrated on pl. XVI is indicated against the corresponding numbers: *2, 3, 11, 14, 17, 20, 21, 23* and *26* to *28* of fig. 14.

Fig. 13. *Design-elements on the black-painted red pottery of the Jorwe Ware, Sub-period I B*

Fig. 14; pl. XVI

1. Bowl[1] of red ware with an everted rim, almost vertical sides bluntly carinated at the junction with the base. Of fine fabric showing oxidized core, it is dressed both externally and internally with a thin red slip. From a late level of Period I.

2. Dish of red ware with an internally-thinned rim and almost vertical sides carinated at the junction with the base. It is painted in black on the outside with pattern J (fig. 13) and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is dressed both externally and internally with a thin red slip. From the latest level of Period I. Also pl. XVI, *4*.

[1] The forms of bowl and dish have been differentiated on the basis of the relation between the height and width at the opening. A vase with a height less than 3/10 of the width has been termed 'dish'.



3. Bowl of the Lustrous Red Ware with an everted internally-thinned rim and sides similar to *2* above. It is painted in black on the outside with pattern B (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is treated both externally and internally with a lustrous red slip. From a late level of Period I. Also pl. XVI, *9*.

4. Bowl of red ware with a slightly thinned rim and concave sides carinated at the junction with the base. It is painted in black on the outside possibly with pattern E (fig. 13), the verticals being missing, and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is treated both externally and internally with a thin red slip which is mat in appearance. From the same level as above.

5. Bowl of the Lustrous Red Ware with a featureless rim and imperceptibly concave sides bluntly carinated at the junction with the base. It is painted in black on the outside with two horizontal bands, one each at the rim and the girth. Of fine fabric showing an oxidized core, it is treated both externally and internally with a lustrous red slip. From the same level as above.

6. Bowl of red ware with a featureless rim and concave sides carinated at the junction with the base. It is painted in black on the outside with pattern N (fig. 13), and on the inside with an irregular rim-band. Of fine fabric showing an oxidized core, it is treated both externally and internally with a thin red slip which is mat in appearance. From surface-collection.

7. Bowl of red ware of the same type as above. It is painted in black on the outside with pattern F (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is wet-smoothed. From the latest level of Period I.

8. Bowl of red ware with a featureless rim and concave sides bluntly carinated at the junction with the base. It is painted in black on the outside with pattern K (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is wet-smoothed. From the same level as above.

9. Bowl of red ware with pronouncedly concave sides and carination. It is painted in black on the outside with pattern G (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is treated both externally and internally with a thin deep-red slip. Parts of the bowl show vitrification resulting from overheating. From a late level of Period I.

10. Dish of red ware with a featureless rim and concave sides. It is painted in black on the outside with pattern M (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is wet-smoothed. From the latest level of Period I.

11. Bowl of red ware with imperceptibly concave sides carinated at the junction with the base. It is painted in black on the outside with pattern B (fig. 13), and on the inside with a thin rim-band. Of fine fabric showing an oxidized core, it is wet-smoothed. From the same level as above. Also pl. XVI, *5*.

12. Bowl of red ware with a carinated profile and a sagger base. It is painted in black on the outside with pattern F (fig. 13), and on the inside with a thin rim-band. Of the same fabric as above. From a late level of Period I.

13. Bowl of red ware with a featureless rim, carinated profile and rounded base. It is painted in black on the outside with pattern L (fig. 13), and on the inside with a simple rim-band. Of the same fabric as above. From the latest level of Period I.

14. Bowl of red ware with a featureless rim, concave sides bluntly carinated at the junction with the base. It is painted in black on the outside with pattern E (fig. 13), and on the inside with a simple rim-band. Of the same fabric as above. From surface-collection. Also pl. XVI, *1*.

15. Dish of red ware with imperceptibly concave sides bluntly carinated at the junction with base. It is painted in black on the outside with pattern C (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing an oxidized core, it is treated externally with a slip. From the latest level of Period I.

16. Diminutive example of related type, painted in black on the outside with pattern E (fig. 13), and on the inside with a simple rim-band. Of the same fabric as *14* above. From a late level of Period I.

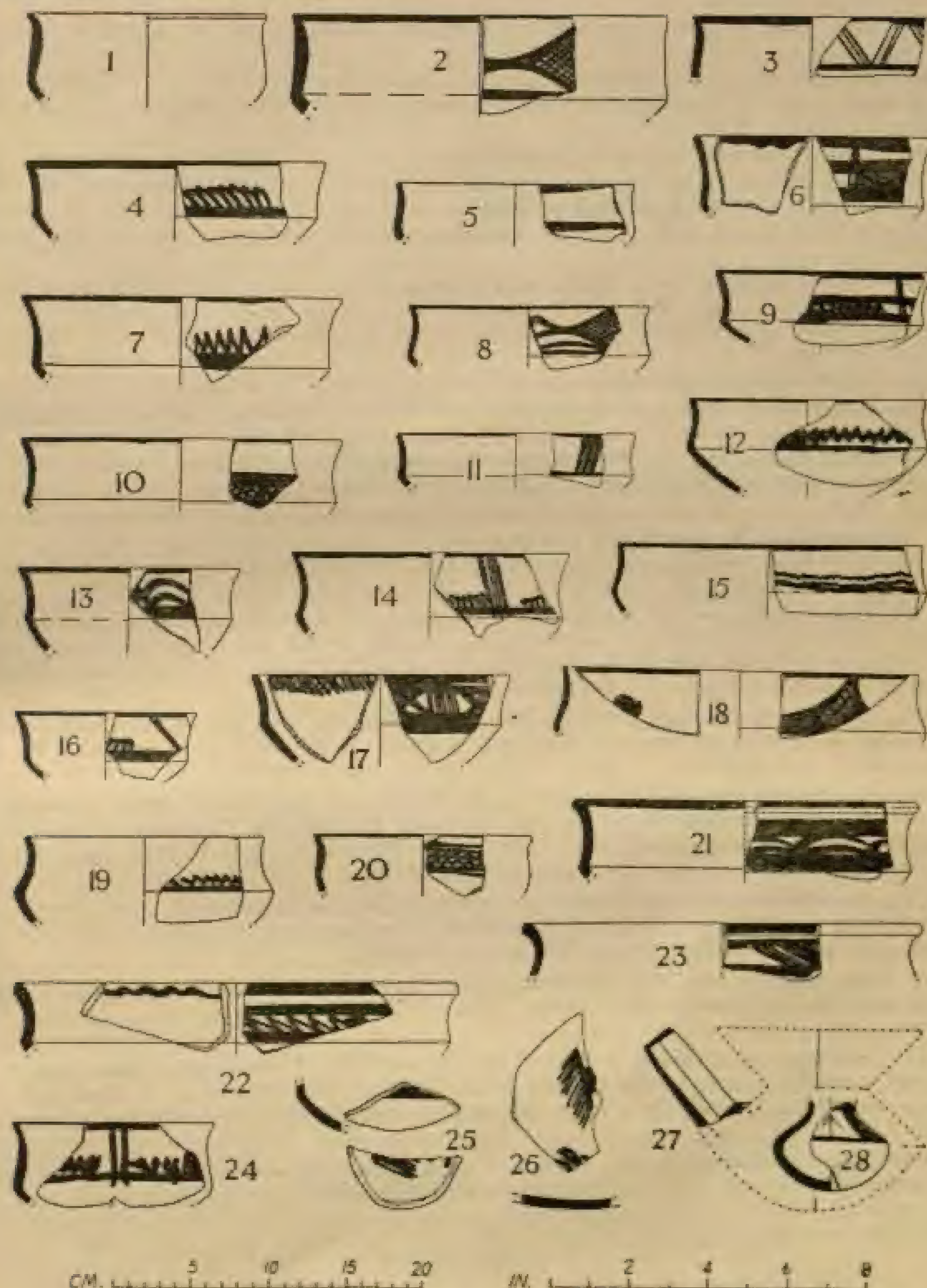


FIG. 14. *Pottery from Sub-period I B: 1, 2, 4 and 6 to 28, black-painted red pottery of the Jorwe Ware, and 3 and 5, of the Lustrous Red Ware*

17. Bowl of red ware with a featureless rim, imperceptibly concave sides sharply carinated at the junction with the base and a deep rounded base. It is painted in black on the outside with pattern P (fig. 13), and on the inside with criss-cross alternating with oblique lines. Of fine fabric showing an oxidized core, it is treated both externally and internally with a red slip. From a late level of Period I. Also pl. XVI, *3*.

18. Dish of red ware with a featureless rim and pronounced bluntly-carinated girth. It is painted in black on the outside with pattern Q (fig. 13), and on the inside with a simple rim-band besides an accidental dropping of black pigment on the inner wall. Of fine fabric showing an oxidized core, it is treated both externally and internally with a red slip. From a late level of Period I.

19. Bowl of red ware with a featureless rim, concave sides carinated at the junction with the base and presumably a sagger base. It is painted in black on the outside with pattern F (fig. 13). Of fine fabric showing an oxidized core, it is wet-smoothed and shows an egg-shell lustre. From the latest level of Period I.

20. Bowl of red ware with an everted rim and concave sides. It is painted in black on the outside with double band of loop or zigzags, bordered above and below by double horizontal bands, panelled below a thin rim-band, and on the inside with a simple rim-band. Of fine fabric showing oxidized core, it is wet-smoothed. From the point of view of fabric, it resembles the Jorwe Ware but its shape is closer to that of the Malwa. From a late level of Period I. Also pl. XVI, *2*.

21. Dish of red ware with a thickened rim and concave sides carinated at the junction with the base. It is painted on the outside with pattern L (fig. 13), and on the inside with a simple rim-band. Of fine fabric showing oxidized core, it is wet-smoothed or self-slipped and has comparatively thicker sides. From surface collection. Also pl. XVI, *7*.

22. Dish of red ware with a featureless rim and concave sides carinated at the junction with the base. It is painted in black on the outside with pattern H (fig. 13), and on the inside with a zigzag band. Of fine fabric but with thicker sides showing an oxidized core, it is treated both externally and internally with a red slip. From a late level of Period I.

23. Dish of red ware with a thickened out-curved rim. It is painted in black on the outside with pattern D (fig. 13). Of the same fabric as *21* above. From a late level of Period I. Also pl. XVI, *6*.

24. Bowl of red ware with a featureless rim and thickened sides bluntly carinated towards the base. It is painted in black on the outside with a variant of pattern E (fig. 13), very irregularly trailed, and on the inside with a simple rim-band. Of medium fabric showing an oxidized core with pores, it is devoid of any surface-treatment. From a late level of Period I.

25. Base-fragment of a bowl of red ware, painted in black on the inner side with an incomplete design showing rows of lines. Of fine fabric showing an oxidized core, it is treated both externally and internally with a red slip. From a late level of Period I.

26. Base fragment, similar to 25 above, painted on the inner side with an incomplete design showing groups of lines issuing from a thicker band. Of the same fabric as above. From surface-collection. Also pl. XVI, *8*.

27. Spout-part of a vase of red ware, reconstructed after a similar shape from Jorwe.[1] It is painted in black at the ends with a simple band. Of fine fabric showing an oxidized core, it is treated externally with a red slip. Traces of luting are also seen. From a late level of Period I. Also pl. XVI, *11*.

28. Miniature vase of red ware, painted on the shoulder with pattern A (fig. 13). The empty space between the verticals is filled with a graffito showing an arrow (fig. 19, *8*). Of fine fabric showing an oxidized core, it is treated externally with a red slip. From the latest level of Period I. Also pl. XVI, *10*.

[1] Sankalia and Deo, *op. cit.* (1955), fig. 61, *1* and pl. XXXIV, *1*.

(iv) *The Lustrous Red Ware*

This Ware, appropriately christened after its surface-dressing, was first identified at Rangpur[1] and has thereafter been reported from a number of sites in Kathiawar and western India extending from Chandoli in Poona District to Ahar in the Banas valley of southern Rajashtan (fig. 6). In its patent fabric it seems to be more at home in the former region wherein it is widespread and occurs in marked profusion. Carefully potted on a wheel, it is characterized by a lustrous slip showing shades of deep-and orange-red.[2] The texture of the paste is dense with sparse to medium concentration of the inclusions comprising grits and produces a straight but rough fracture. It is fired at a medium temperature and sometimes shows an unoxidized smoky zone in mid-sections.

The smooth burnished shiny surface often carries painted designs in black pigment which shows no fusion with the body.[3] The designs comprise: ladders; chevrons; suspended loops, occasionally intersecting; opposed triangles; hatched diamonds; fish; and the ubiquitous groups of horizontal or vertical or converging or wavy lines. Apart from these severely geometric and linear patterns, portrayals of animals like the deer and bull and rows of birds, often stylized, are also included in the repertory of painted designs. The method of decoration was essentially 'zonal' or 'tectonic', being confined largely to the upper half of the vessels in registers.

Common shapes represented include: the concave-sided bowl with or without a carinated profile; the stud-handled bowl; the dish-on-stand; the dish with markedly less carinated shoulders; the stemmed bowl; and the jar, often high-necked.[4]

On the vital question of the origin or source of the Lustrous Red Ware, it has been averred that the Ware was not an intrusion but a local transmutation of the Harappa Culture itself, the principal forms in the former being developed in stages from their Harappan counterparts, and the surface dressing being only a style resulting from an obvious urge for resurgence after a degenerate phase of the Harappa Culture.[5] For similarities with other contemporary chalcolithic cultures of western and central India, the concave-sided bowl with zonal decoration can be paralleled with those in the Jorwe Ware and the stemmed bowl and the dish with those of the Malwa Ware, the repertory of designs being, in the main, common with that of the Jorwe, excepting, however, the individualistic animal-motifs.

The comparative stratigraphical position of this Ware on the hitherto-excavated sites is as follows: Rangpur, Sub-period II C and Period III, with the former as only a formative stage and the latter as a floruit; Bahal, I B; Navdatoli, Phase IV of the chalcolithic period, slightly later than the appearance at the site of the Jorwe Ware; and Ahar, Period I C. Whereas the particular strata at Rangpur is assigned by sequence-dating to

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[1] *Indian Archaeology 1953-54—A Review* (1954), p. 7; also S. R. Rao, *op. cit.*, pp. 97-127.

[2] On the composition of the slip the Archaeological Chemist in India reports as follows: 'The surface is rendered smooth by burnishing and given a slip of finely-levigated red ochre. It is also probable that in its green state, the pot was subjected to burnishing with pebbles of haematite, which left a fine powder of iron oxide securely adhering to the surface. The pot was then fired in oxidizing atmosphere'.

[3] Chemist's note: 'The decoration in black was evidently post-firing, as the black pigment does not show any evidence of sintering and does not stick firmly to the red surface'.

[4] Rao, *op. cit.*, pp. 103-104, and 109-116; also M. G. Dikshit, 'Excavations at Rangpur: 1947', *Bull. Deccan College Res. Inst.*, XI, no. 1 (Dec. 1950), pp. 3 ff.

[5] Rao, *op. cit.*, pp. 23, 24, 97 and 98.

circa 1100-800 B.C.,[1] at Navdatoli and Ahar it is dated, on the basis of the Corbon-14 determinations, respectively to 1440 ± 130 B.C.,[2] (P-205) 1275 ± 110 B.C.,[3] (TF-31). On the above showing, the ascribed Rangpur dates seem to be more on the younger side. A chronological span between fifteenth and twelfth century B.C. is thus indicated for this Ware.

The evidence at Prakash accords well with the above findings. Only six sherds of this Ware, occurring almost co-extensively with the black-painted red Jorwe Ware, were obtained from the excavation. Of these, two belonging to the bowl-type, have been illustrated (fig. 14, *3* and *5*). The remaining sherds, doubtlessly bowl-forms, were largely fragmentary. In view of the very limited number of sherds obtained from this site, illustration of the design-elements of this Ware is not considered necessary.

(v) *Other decorated ware*

This class of pottery includes decorated ware of the incised and appliqué variety. The entire range of this ware, excepting perhaps the large jars and troughs, is wheel-made. The surface-colour varies from mottled smoky-grey through drab to tan-brown, and in most cases shows a slight sheen as a result of burnishing. The direction of the burnishing strokes is mostly horizontal. Occasional instances of vertical strokes are not wanting (fig. 15, *10*). The texture of the paste is dense and often granular, showing sparse to medium concentration of the inclusions, comprising medium-sized minerals and some vegetable-matter, and takes an irregular rough fracture. The ware is relatively low-fired and shows an incomplete oxidization of the core which remains smoky-black in most of the cases.

The decoration was executed when the paste was either plastic and yielding or leather-hard. It may be observed that excepting a few examples (fig. 16, *26*) no raised edges or burrs along the incised lines are noticed in the patterns which, in general, show clean margins. From the profile and width of the troughs and the style and quality of the line, the incising techniques or other technical minutae can be inferred. Much, however, depends upon the shape of the effective part of the tool and the manner it is held than on the class of tool itself. Two types of tools seem to have been employed to produce these designs: (a) gouge which gives a smooth groove by cutting the clay rather than compressing or displacing it and (b) knife-blade for cutting and scraping, with the line free from heel. In most cases the effect seems to have been produced by cutting away or excising the plastic clay by these tools. Excision rather than incision, therefore, is more apparent. The design repertoire is essentially simple and consists of: oblique or vertical slashes (fig. 15, *1*, *3*, *4*, *5*, *7* and *12*); herring-bone or chevrons (fig. 15, *9*, *11*; fig. 16, *24* and *27*); zigzags or wavy lines (fig. 15, *14* and *18*; fig. 16, *26*); criss-cross (fig. 15, *19*; fig. 16, *25*); and circlets (fig. 15, *2* and *15*). Amongst the appliqué designs, the representational one with the tortoise (fig. 16, *20*) deserves special attention. Herring-bone and wavy line designs are also repeated on the pottery of Lothal B. Navdatoli affords parallels for vertical or oblique slashes, herring-bone and criss-cross designs.[4]

The shapes represented include: the globular-bodied vase with out-turned, flared or out-curved rims; the large storage-jar; and the dish. The specific use to which the dish

[1] Rao, *op. cit.*, p. 27.

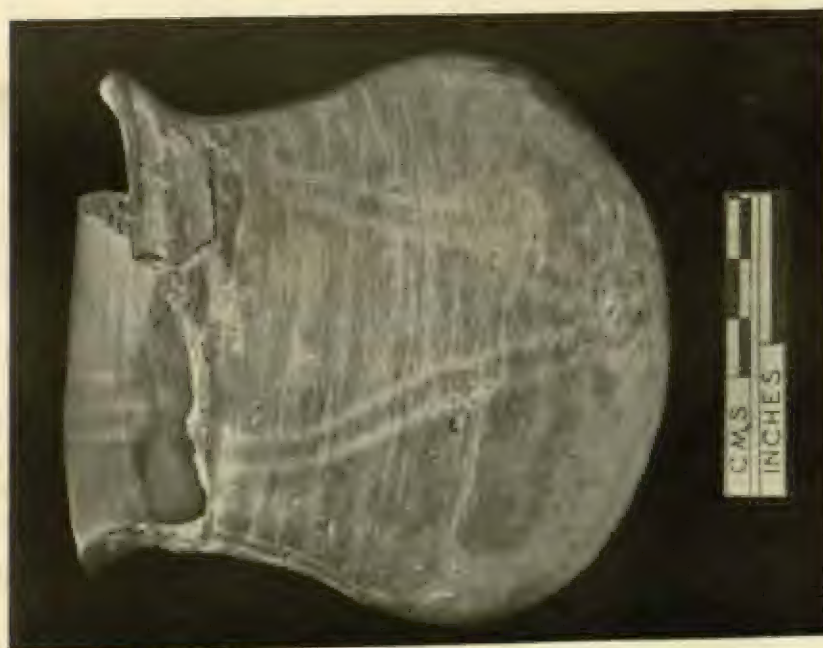
[2] K. Ralph, *op. cit.*, p. 52; also below, p. 155.

[3] Kusumgar, Lal and Sarna, *op. cit.*, pp. 275-76; also below, p. 158.

[4] Sankalia, Subbarao and Deo, *op. cit.* (1958), pp. 128-32 and 246.



B. *Black-painted red Malwa Ware, Period I. See p. 39*



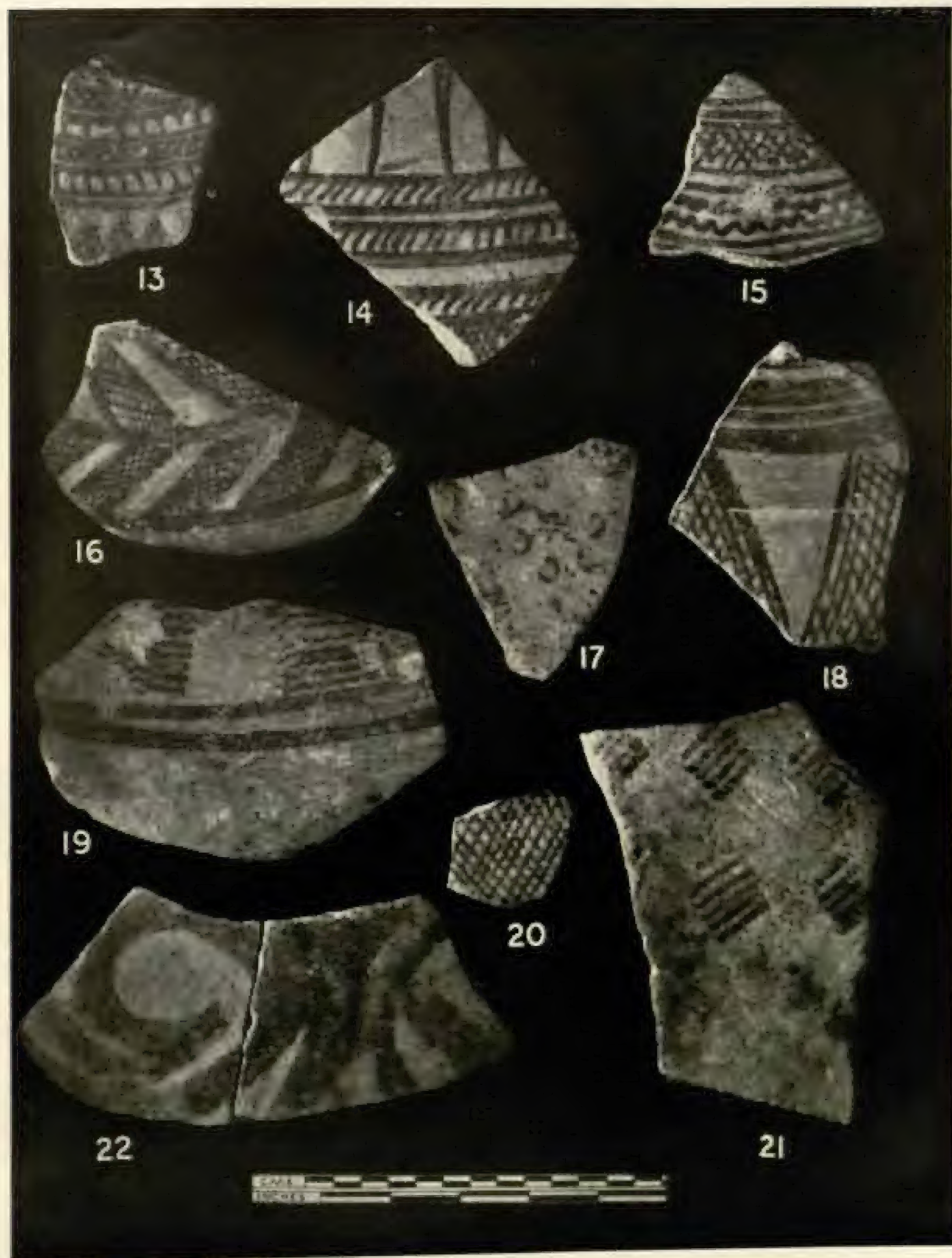
A. *White-painted grey ware, Period I. See p. 33*

To face p. 56



Black-painted red pottery of the Malwa Ware, Period I. See pp. 44–47

To face pl. XIV



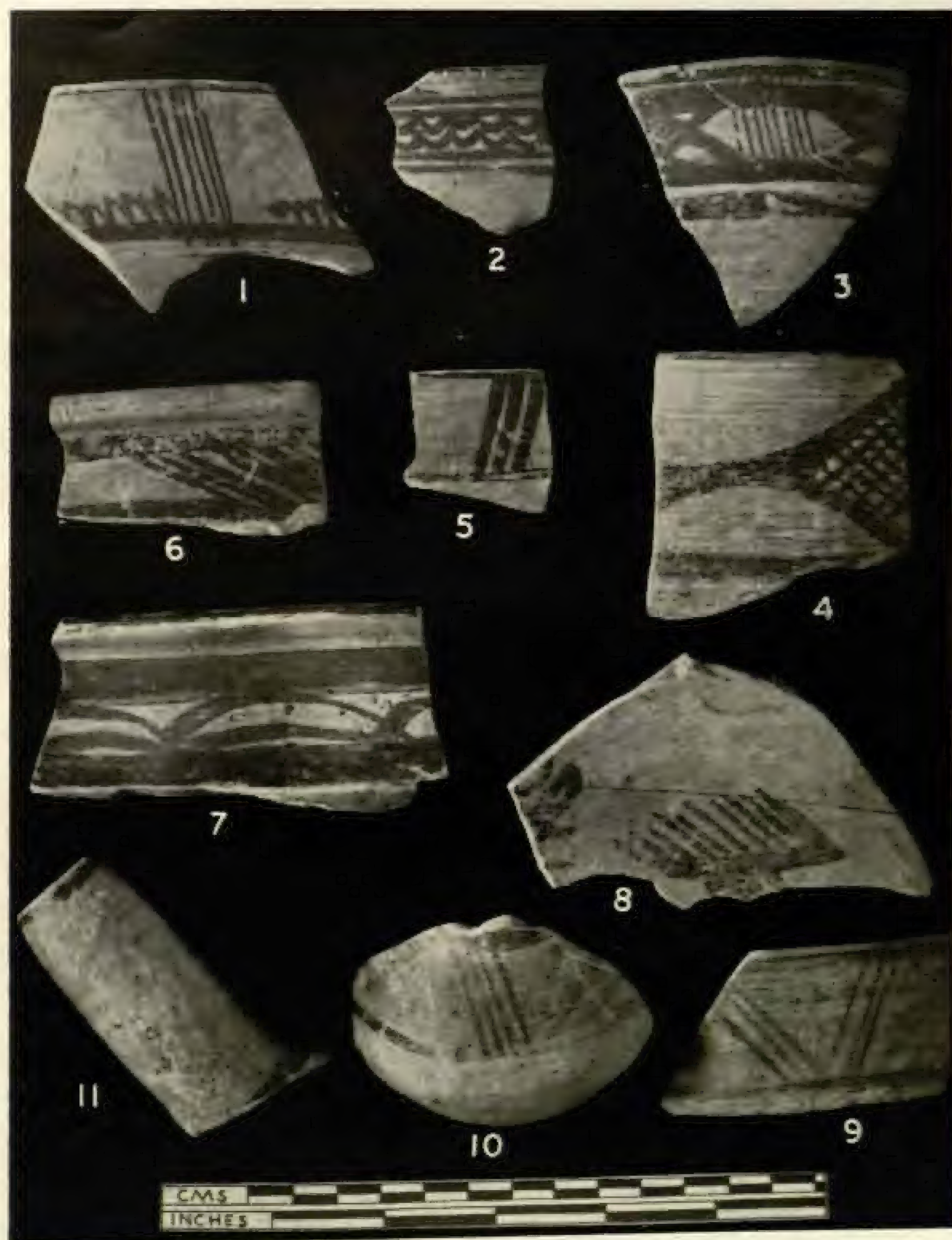
Black-painted red pottery of the Malwa Ware, Period I. *See pp. 44–47*

To face pl. XIII



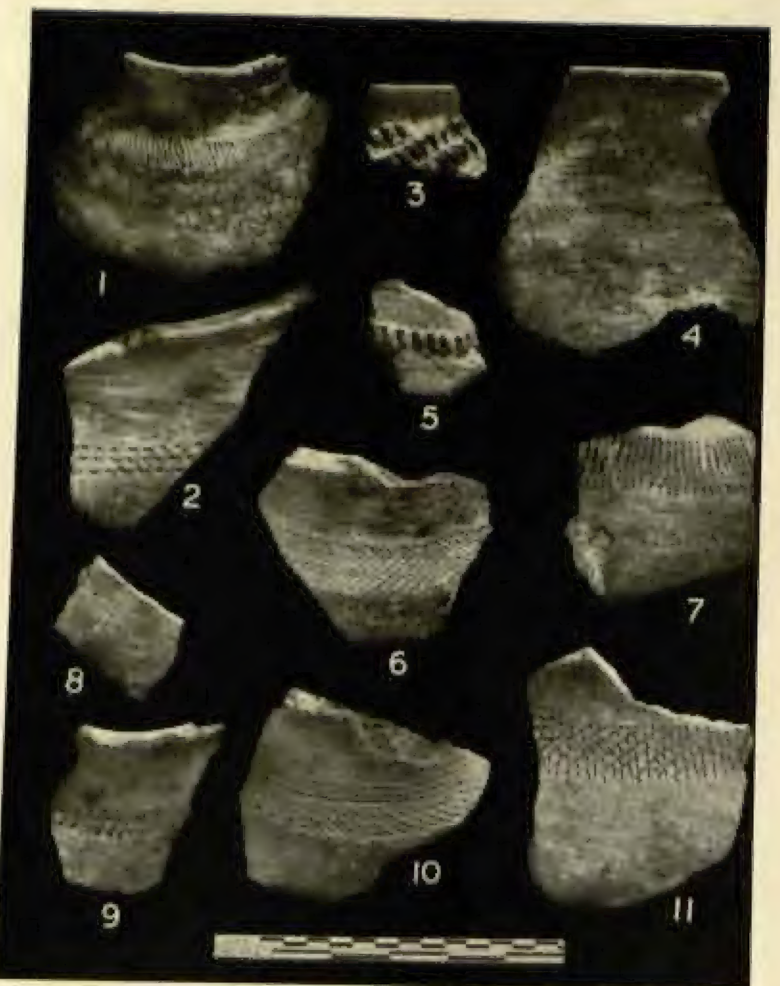
Animal motifs on the black-painted red ware, Period I. *See pp. 47–49*

To face pl. XVI

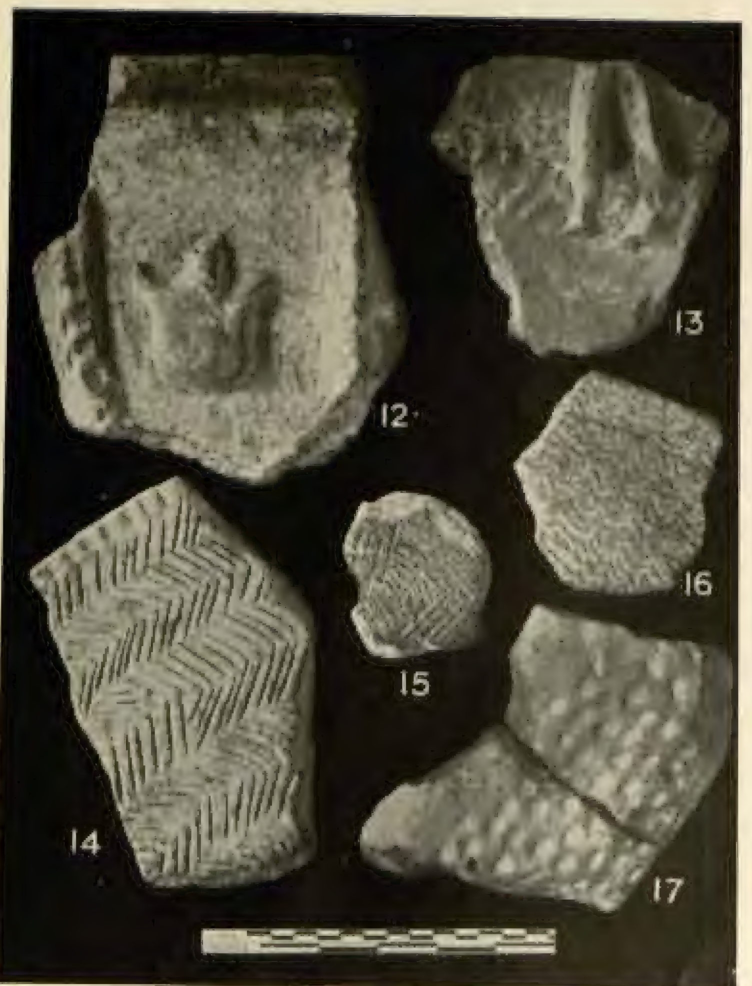


Black-painted red pottery of the Jorwe Ware, Sub-period I B. *See pp. 51–54*

To face pl. XV



A. *Other decorated ware, Period I. See pp. 57–59*



B. *Other decorated ware, Period I. See pp. 59–61*

To face p. 57

was put to is, however, difficult to determine. Cognate decorated forms have been classed as husking trays[1] whereby the grain is held by the incised furrows, while the straw is blown away.

This ware forms 4·17 per cent of the total yield of pottery in Period I, and, excepting the lowest two levels, shows a fairly consistent distribution, indicative of a regular element in the ceramic traits of the Period.

The following select examples are illustrated. Reference to the sherds illustrated on pl. XVII is indicated against the corresponding numbers: *1* to *3*, *8*, *9*, *11*, *13*, *15*, *17* to *21* and *23* to *26* of figs. 15 and 16.

Figs. 15 and 16; pl. XVII

1. Vase of drab ware with an everted rim, short vertical neck and globular body. It is decorated on the shoulder with regularly-produced oblique slashes. Of coarse fabric which has burnt smoky-grey in the core-section, it is burnished externally, the burnishing strokes being horizontal. From a mid-level of Period I. Also pl. XVII A, *1*.

2. Vase of tan-brown ware with an out-turned thinned rim, short vertical neck and globular body. It is decorated on the shoulder with three rows of circlets. Of coarse fabric showing an unoxidized smoky core, it is burnished externally, the burnishing strokes being horizontal. From a mid-level of Period I. Also pl. XVII A, *2*.

3. Vase of light-tan ware with an out-turned rim, the lip-part being broken, short concave neck and oblique shoulders. It is decorated on the shoulder with oblique slashes. Of coarse fabric showing an unoxidized smoky core, it is wet-smoothed externally. From the same level as above. Also pl. XVII A, *9*.

4. Vase of tan-brown ware with an out-curved featureless rim and concave neck. It is decorated on the shoulder with oblique slashes different from those of *1* above. Of coarse fabric showing an unoxidized smoky core, it is burnished externally, the burnishing strokes being horizontal. From the same level as *1* above.

5. Fragment of a vase of tan-brown ware. It is decorated on the shoulder with oblique slashes, wider spaced than in *3* above. Of coarse fabric showing an unoxidized portion in mid-section of the core, it is burnished externally, the burnishing strokes being horizontal. From a mid-level of Period I.

6. Vase of drab ware with a splayed-out featureless rim, carinated neck and possibly globular body. It is decorated on the lip with finger-nail incisions. Of coarse fabric showing an unoxidized smoky core, it is devoid of any surface dressing. From a mid-level of Period I.

7. Vase of smoky grey ware with a splayed-out featureless rim, short concave neck and globular body. It is decorated at the base of the neck with a single row of oblique slashes. Of coarse fabric showing smoky grey section, it is wet-smoothed externally. From a late level of Period I.

8. Vase of red ware with a vertical featureless rim and oblique shoulders. It is decorated on the shoulder with an appliqué design showing oblique bands of incised slashes. Of medium fabric showing an oxidized brick-red core, it is devoid of any surface-dressing. From the latest level of Period I. Also pl. XVII A, *3*.

9. Vase of drab ware with an out-turned featureless rim, concave neck and ovoid body. It is decorated on the shoulder with herring-bone pattern. Of coarse fabric showing an unoxidized smoky core, it is burnished externally. From a mid-level of Period I. Also pl. XVII A, *4*.

[1] Seton Lloyd and Fuad Safar, 'Tell-Hassuna, excavations by the Iraq Govt. Directorate General of Antiquities in 1943 and 1944', *Journal of the Near Eastern Studies*, IV, no. 4, Oct. 1945, and Robert J. and Linda Braidwood, James G. Smith and Charles Leslie, 'Matarrah: a southern variant of the Hassuna assemblage, excavated in 1948', *ibid.*, XI.

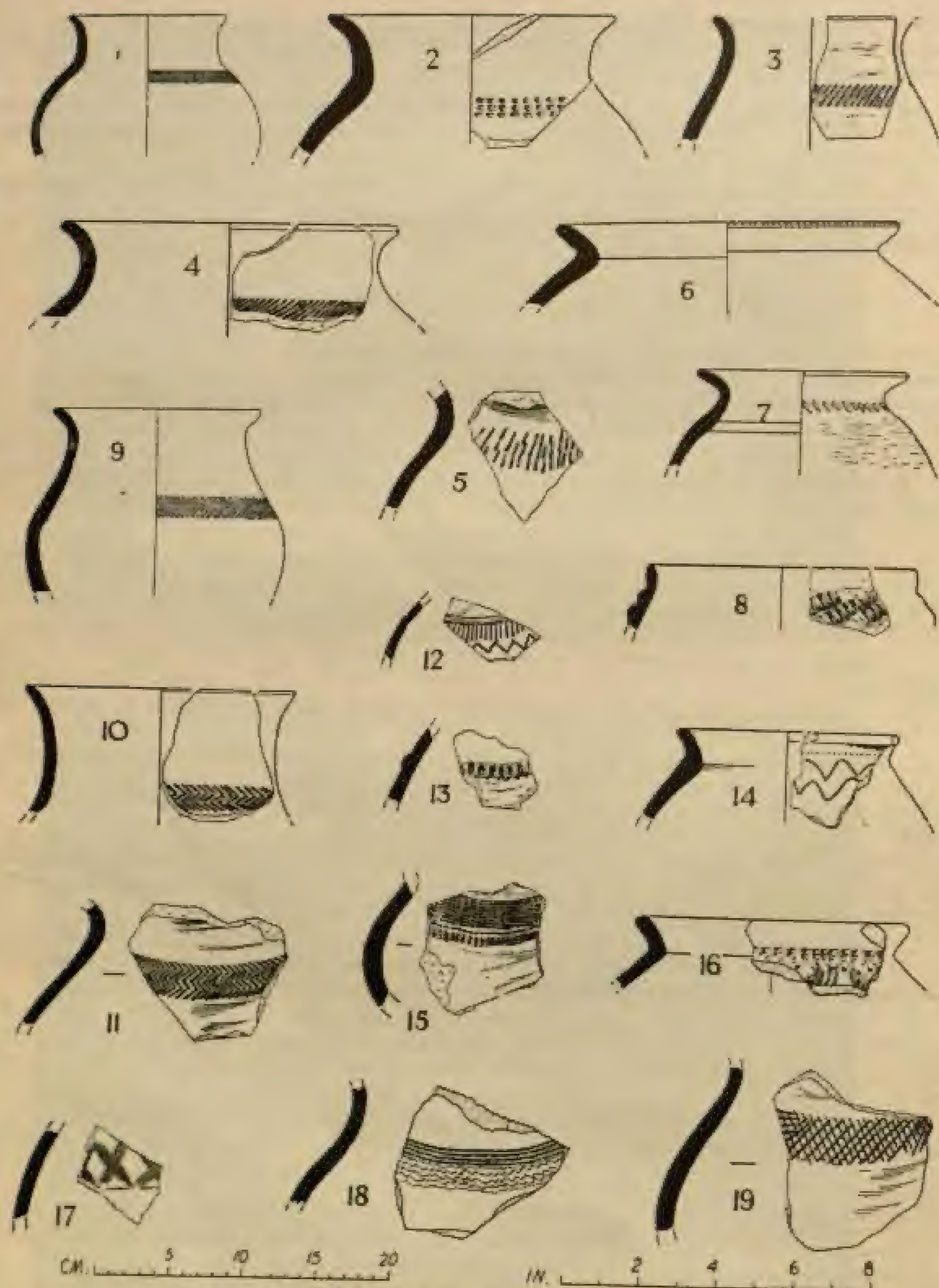


FIG. 15. *Pottery from Period I: other decorated ware*

10. Vase of drab ware with a featureless rim and long concave neck. It is decorated on the lower part of the neck with a variant of herring-bone pattern. Of medium fabric showing oxidized smoky core, it is burnished externally, the burnishing strokes being vertical. From a late level of Period I.

11. Fragment of a vase of drab ware, decorated on the shoulder-part with a double row of herring-bone pattern. Of coarse fabric showing unoxidized smoky core, it is burnished externally, and also partly on the inside, the burnishing strokes being horizontal. From a mid-level of Period I. Also pl. XVII A, *6*.

12. Fragment of a vase of red ware, decorated on the shoulder-part with vertical incisions above a horizontal zigzag line. Of medium fabric showing an oxidized brick-red core it is devoid of any surface-dressing. From an unstratified deposit.

13. Fragment of a vase of tan-brown ware, decorated on the shoulder-part with an appliqué band of finger-nail incisions. Of coarse fabric showing an unoxidized smoky core, it is devoid of any surface-dressing. From an early level of period I. Also pl. XVII A, *5*.

14. Fragment of a vase of drab ware with an out-turned featureless rim, carinated neck and oblique shoulders. It is decorated on the shoulder with a double row of zigzags below a single row of incised dots. Of coarse fabric showing an unoxidized smoky core, it is devoid of any surface dressing. From a mid-level of Period I.

15. Fragment of a vase of drab ware with a globular body, decorated on the shoulder with rows of dots or circlets. Of coarse fabric showing an unoxidized smoky core, it is burnished externally, the burnishing strokes being horizontal. From a mid-level of period I. Also pl. XVII A, *7*.

16. Fragment of a vase of drab ware with an out-turned rim and carinated neck. It is decorated on the shoulder with an incomplete pattern below rows of incised dots. Of coarse fabric showing an oxidized core, it is burnished externally, the burnishing strokes being horizontal. From an early level of Period I.

17. Fragment of a vase of drab ware, decorated on the shoulder-part with incised lines forming diamonds. Of coarse fabric showing unoxidized core, it is wet-smoothed externally. From a mid-level of Period I. Also pl. XVII A, *8*.

18. Fragment of a vase of light-brown ware, decorated on the shoulder with wavy lines below horizontal grooves. Of coarse fabric showing an unoxidized smoky core, it is burnished externally, the burnishing strokes being horizontal. From a mid-level of Period I. Also pl. XVII A, *10*.

19. Fragment of a vase of smoky-grey ware, decorated on the shoulder with criss-cross lines. Of coarse fabric showing an unoxidized smoky core, it is wet-smoothed externally. From the same level as above. Also pl. XVII A, *11*.

20. Fragment of a jar or trough of drab ware with an out-turned thinned rim and almost vertical sides. It is decorated on the shoulder with an appliqué motif of a tortoise, panelled between two verticals of finger-tip design. Of coarse thick fabric showing an unoxidized smoky core, it is devoid of any surface treatment. From the latest level of Period I. Also pl. XVII B, *12*.

21. Fragment of a jar or trough of drab ware, decorated on the shoulder portion with appliqué design showing finger tipped horizontal band over-ridden by a loop-like incomplete pattern. Of the same fabric as above. From a mid-level of Period I. Also pl. XVII B, *13*.

22. Fragment of a vase of light-brown ware, with an out-curved thinned rim, decorated at the lower portion of the neck with appliqué design of finger-nail incisions. Of the same fabric as 20 above. From a late level of Period I.

23. Rim-fragment of a vase of drab ware, decorated on the inner lip with rows of depressed circlets, and on the outer concavity with appliqué bands showing incisions. Of the same fabric as 20 above. From a late level of Period I. Also pl. XVII B, *17*.

24. Shallow dish of drab ware with progressively thickened base. It is decorated on the lip with excised finger-tip, and on the inner sides with deeply incised rows of herring-bone pattern. Of coarse fabric showing an incompletely oxidized core, it is devoid of any surface-dressing. From a late level of Period I. Also pl. XVII B, *14*.

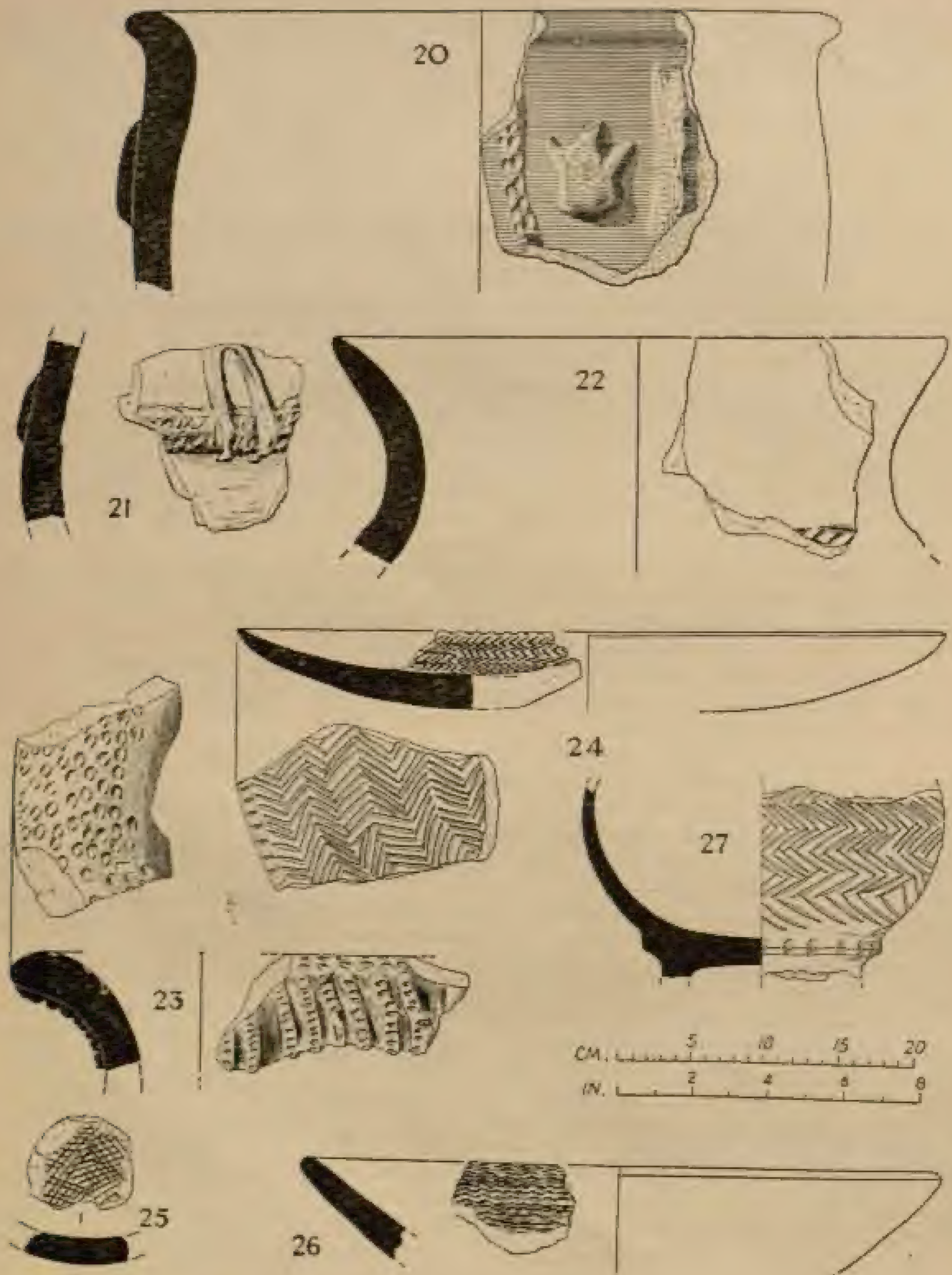


FIG. 16. *Pottery from Period I: other decorated ware*

25. Base-fragment of a dish of drab ware, decorated on the inner side with irregularly incised criss-cross lines. Of the same fabric as above. From a mid-level of Period I. Also pl. XVII B, *15*.

26. Dish of drab ware, decorated on the inner side with continuous wavy lines. Of coarse fabric showing an unoxidized smoky core, it is devoid of any surface-treatment. From a mid-level of Period I. Also pl. XVII B, *16*.

27. Lower part of a vase of drab ware with an incomplete base. It is decorated with continuous herring-bone pattern. Of medium fabric, imperfectly oxidized, it is devoid of any surface dressing. From a late level of Period I.

(vi) *Coarse burnished and other plain wares*

The pottery under this class includes: (a) thick, medium-to-coarse ware, largely burnished and having a blotchy-grey appearance, and (b) plain red ware, usually slipped. Of these, the former was a dominant and easily distinguishable industry. The entire range of the two varieties excepting a few hand-modelled vases (fig. 17, *3* and *4*) is wheel-made. As a comparison, however, it may be mentioned that the pots of the burnished ware do not seem to have been thrown on a fast wheel since the striations are often irregular and indistinct though largely due to compaction from rubbing.

The surface-colour of the first variety ranges from drab through blotchy-grey to blackish-grey and shows a dull lustre obtained by horizontal burnishings. Indifferent firing in a few cases has resulted in a mottled surface. The texture of the paste is, as a rule, dense showing sparse to medium concentration of the inclusions which largely consist of minerals. The paste, however, seems to be well-graduated. Built mostly in thicker section, it takes an irregular rough fracture. It is relatively low-fired as the incised decorated ware, and often shows an unoxidized smoky core. The ware gives the impression of solidity due to the heaviness of its body. A distinctive feature of this ware is an ochreous paint, usually applied after firing on the rim-portions (fig. 17, *1* and *11*). The ware is represented in a few limited shapes of which the dish or dough-platter (fig. 17, *1*) and the lid (fig. 17, *9* to *11*) are noteworthy. Both these shapes occur at Bahal, Daimabad, Nevasa and Nagda in chalcolithic contexts. Of unusual interest, however, is the dish with looped feet (fig. 17, *2*), a type so far unreported from any other post-Harappan chalcolithic assemblage in India. This type of base with looped feet in variant forms is fairly well-known on sites in Palestine, Anatolia, the Amuq plain, Mesopotamia and at Sialk in the second millennium B.C. Its closer analogies are seen at Harappa,[1] Nuzi[2] and Necropole A at Sialk.[3] Other shapes in this ware include the bowl (fig. 17, *6* to *8*) and vase with out-curved rim (fig. 18, *12*). The knobs and loops, respectively of the lids and platters, seem to be separately built and attached to the vessel, for there are breakage which normally would not result from integral throwing.

This ware forms 8·55 per cent of the classified pottery of Period I, being numerically third in the total yield, and vertically shows a differential distribution ranging from 12·53 per cent in the lowest level to 3·96 in the top level. Although there is no consistency in its distribution, a larger percentage in the lower levels is clearly borne out.

The fabric of the second variety, viz. the plain red ware, is similar to that of the ware described under (ii) above (pp. 35-37) and need not be repeated here. Amongst the

[1] M. S. Vats, *Excavations at Harappa*, II (Calcutta, 1940), pl. LXXI, *64*.

[2] Richard F. S. Starr, *Nuzi, Report on the Excavations at Yorgan Tepe, near Kirkuk, Iraq* (Cambridge, Mass., 1937), pl. 92.

[3] Schaeffer, *op. cit.*, fig. 262, *2*.

commonest shapes met with are: the vase with flaring or out-curved (fig. 18, *18* and *21*) or collared (fig. 18, *23*) rim; the dish (fig. 18, *30*); and the trough-shaped vase (fig. 18, *26*).

The distribution percentage of this non-descript industry is hardly significant and need hardly be dwelt upon here.

The following select types are illustrated.

Figs. 17 and 18

1. Shallow dish of blotchy-grey ware with a featureless rim, painted on the lip-part with an ochreous coat applied after firing. The illustrated example is of thick coarse fabric showing a smoky core indifferently fired, and is burnished internally, the burnishing strokes being horizontal. From a mid-level of Period I. *Variant 1a* differs from the above in having a squared lip, externally grooved and deeper sides. The illustrated example is of thick coarse fabric showing an unoxidized smoky core towards the inner side, has burnt black inside and drab outside and is burnished with horizontal strokes. From the earliest level of the Period.

2. Shallow dish of the same shape and fabric as 1 above but distinguished by loop feet which seem to be luted separately to the underside of the dish in a tongue-and-anvil technique. The illustrated example is from a mid-level of Period I.

3. Miniature hand-made bowl of drab ware with rounded sides and flattish base. The illustrated example is of thick coarse fabric and is imperfectly fired. From the earliest level of Period I.

4. Hand-made bowl of red ware with a flaring rim and incomplete base. It may be part of a composite vase of which the lower part is missing. The illustrated example is of thick coarse fabric showing an unoxidized smoky core and is treated both externally and internally with a red slip. From the same level as *1* above.

5. Vase of smoky-grey ware with an out-turned pointed rim and rounded sides. The illustrated example is of thick coarse fabric showing a smoky core and is burnished externally, the burnishing strokes being roughly horizontal. From an early level of Period I.

6. Bowl of drab ware with a squared vertical rim and progressively thickened sides. The illustrated example is of thick medium to coarse fabric showing a brick-red core and is devoid of any surface-dressing. From the same level as *2* above. *Variant 6a* differs from the above in being less deep. The illustrated example is of medium fabric and is burnished internally and possibly wet-smoothed externally. From an early level of the Period.

7. Bowl of drab ware with a slightly out-curved featureless rim and deeper sides. The illustrated example is of thick medium fabric showing an unoxidized section of the core and is wet-smoothed. From a mid-level of Period I.

8. Bowl of drab ware with a slightly out-curved internally thinned rim and convex sides. The illustrated example is of thick medium fabric showing an unoxidized smoky core in the mid-section, and is devoid of any surface-dressing. From the earliest level of Period I.

9. Lid of red ware having a cylindrical knob with a flat top, the column-like knob rising above the rim-level. The illustrated example is of thick medium fabric showing an unoxidized core in the mid-section, and is burnished both externally and internally. From a late level of Period I. *Variant 9a* differs from the above in having a groove below the rim on the outside. The central konb is, however, missing. The illustrated example is of thick medium fabric and has burnt black on the inside and blotchy on the outside. It is burnished both externally and internally, sometimes the strokes crossing each other. From a late level of the Period. *Variant 9b* differs from the main type in having a stumpy knob. The illustrated example is of thick coarse fabric, shows an unoxidized smoky core and is wet-smoothed. From the latest level of Period I.

10. Lid of drab ware with a longish knob. The illustrated example is of thick coarse fabric, has burnt black inside and red outside and shows an unoxidized smoky core. From surface-collection.

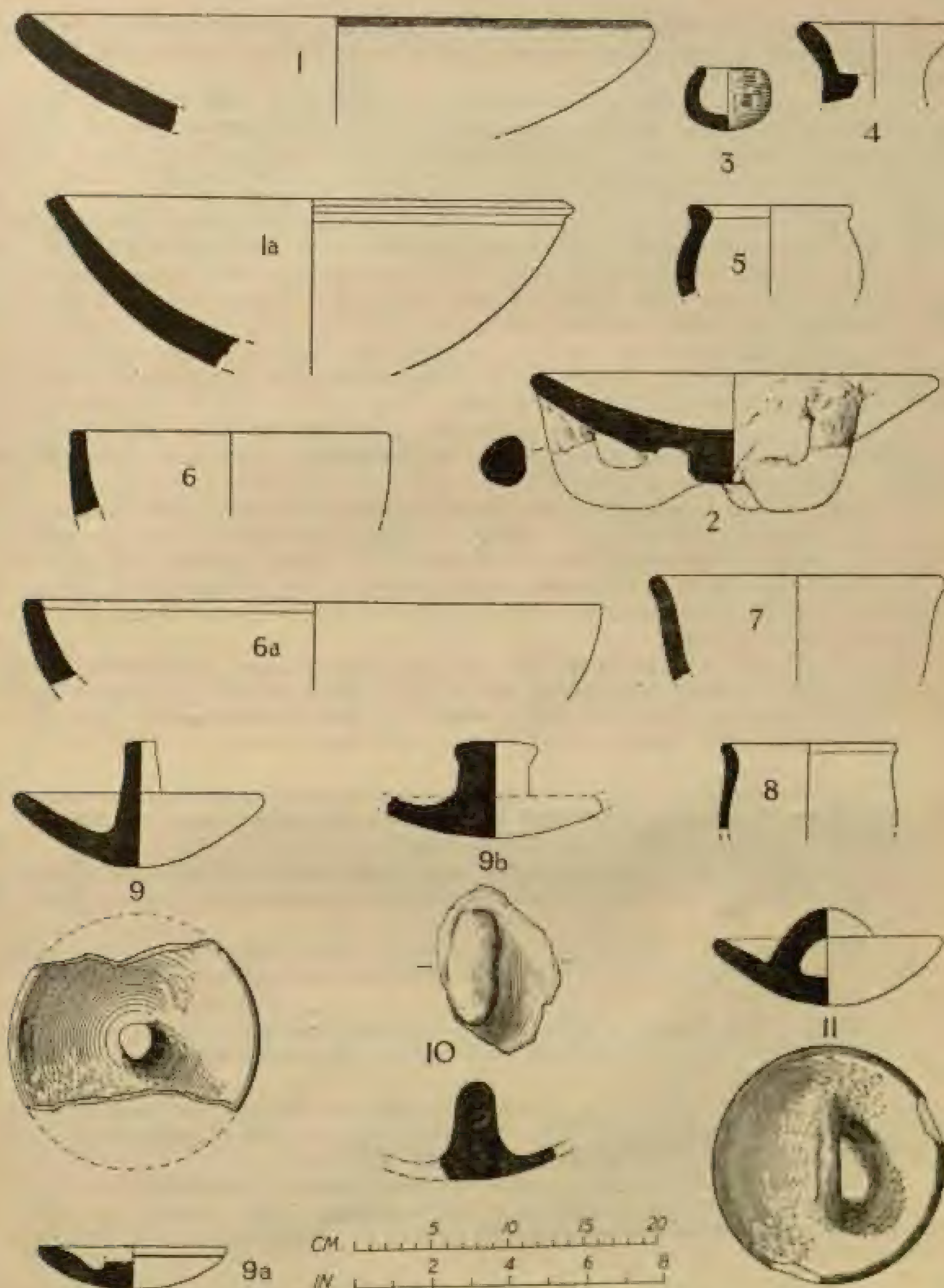


FIG. 17. *Pottery from Period I: coarse burnished and other plain wares*

11. Lid of grey ware with a strap-handle. The illustrated example is of thick medium fabric showing a smoky core, is wet-smoothed internally and is treated with an ochreous paint on the lip. From a mid-level of Period I.

12. Rim-fragment of a vase of grey ware with a concave neck. The illustrated example is of thick medium to coarse fabric showing an incompletely oxidized core and is burnished externally with horizontal burnishing strokes. From the earliest level of Period I. *Variant 12a*, of the same fabric as above, differs from the main type in having a thinned rim. The illustrated example is from the same level as above. *Variant 12b*, of drab ware, differs from the main type in having a long concave neck. The illustrated example is of thick coarse ware showing an unoxidized smoky core towards the inner side and is burnished both externally and internally. From a late level of Period I.

13. Rim-fragment of a vase of red ware showing a flaring angle. The illustrated example is of thick medium fabric showing an unoxidized smoky core and is dressed with a red slip on the outside. From the latest level of Period I.

14. Rim-fragment of a vase of drab ware showing a splaying angle. The illustrated example is of coarse thick fabric showing an unoxidized smoky core in the mid-section, and is burnished externally. From a mid-level of Period I.

15. Fragment of a vase of tan ware with an out-turned rim and almost vertical neck. The illustrated example is of medium fabric showing an unoxidized smoky core and is burnished externally. From a mid-level of Period I.

16. Fragment of a vase of grey ware with an out-turned rim, sharply carinated neck and globular body. The illustrated example is of thick medium fabric showing a smoky core and is burnished externally, the burnishing strokes being horizontal. From the earliest level of Period I.

17. Bowl of greyish black ware with a short splayed-out rim, carinated neck and possibly convex sides. The illustrated example is of the same fabric as *16* above and is burnished externally. From an early level of Period I.

18. Rim-fragment of a vase of drab ware showing a flaring angle. The illustrated example is of medium fabric showing a brick-red core and is wet-smoothed. From a late level of Period I. *Variant 18a* differs from the above in having a thinned rim and a concave neck. The illustrated example is of medium fabric showing a brick-red core and is wet-smoothed. From a late level of Period I.

19. Fragment of a vase of red ware with an out-curved thickened nail-head rim and concave neck. The illustrated example is of medium fabric showing an unoxidized smoky core and is treated externally with a red slip. From an early level of Period I.

20. Rim-fragment of a drab ware showing ridges on the neck. The illustrated example is of medium fabric showing an incompletely oxidized core and is wet-smoothed. From a mid-level of Period I.

21. Rim-fragment of a vase of red ware showing a long concave neck. The illustrated example is of fine fabric showing a fully oxidized brick-red core and is treated externally with a thin red slip. From the earliest level of Period I.

22. Rim-fragment of a vase of red ware with expanding shoulders. The illustrated example is of medium fabric showing an unoxidized smoky core in the mid-section and is wet-smoothed. From an early level of Period I.

23. Fragment of a vase of red ware with a vertically externally-collared rim and expanding shoulders. The illustrated example is of fine-to-medium fabric showing an oxidized brick-red core and is devoid of any surface-dressing. From a mid-level of Period I.

24. Fragment of a vase of red ware with an out-turned featureless rim, almost vertical neck and globular body. The illustrated example is of fine-to-medium fabric showing an unoxidized smoky core in the mid-section and is treated with a slip on the outside and down to the neck on the inside. From the same level as above.

25. Fragment of a vase of red ware with an out-turned or short splayed-out rim, bluntly carinated at the neck and expanding shoulders. The illustrated example is of fine-to-medium fabric

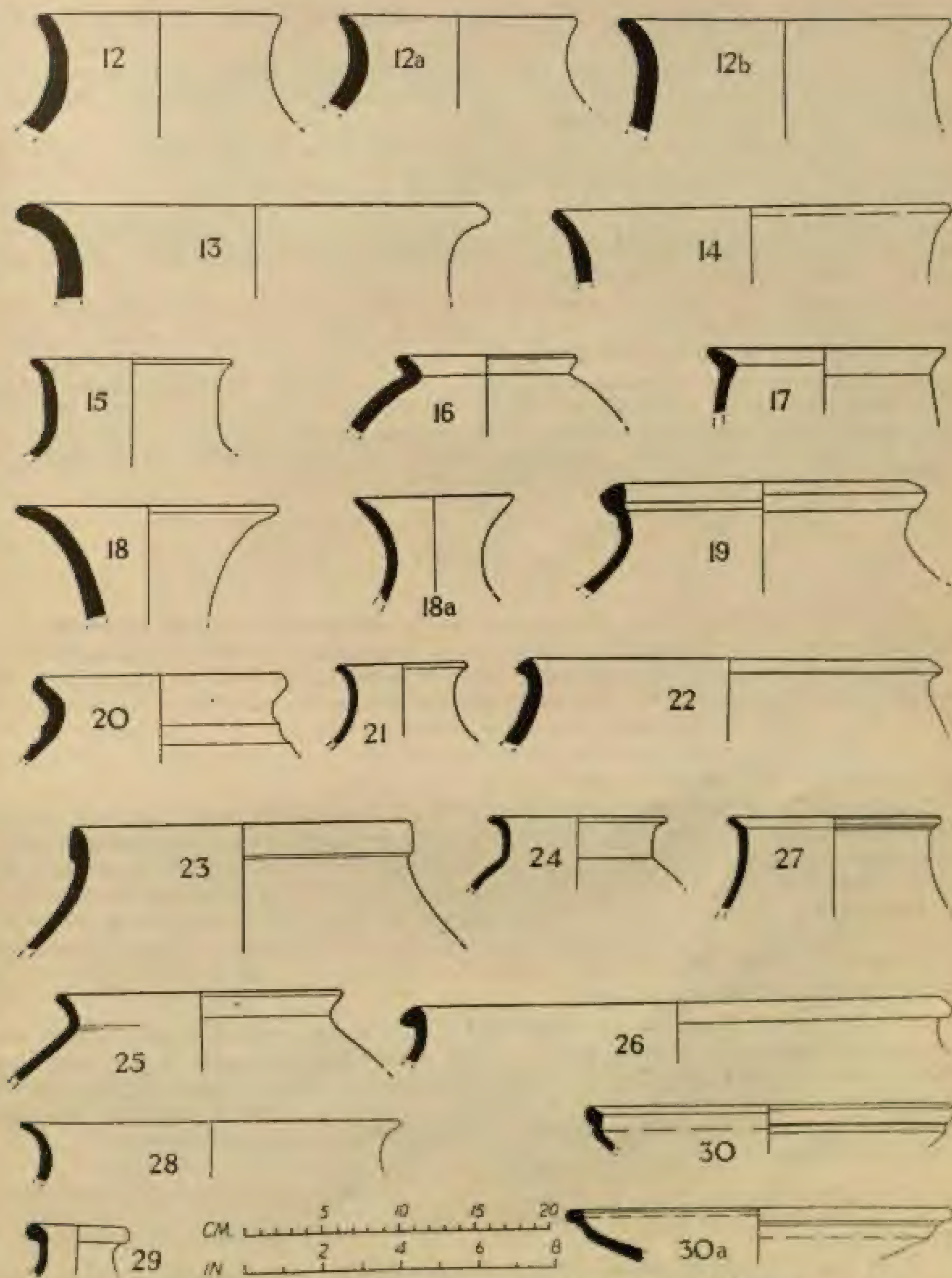


Fig. 18. *Pottery from Period I: coarse burnished and other plain wares*

showing an incompletely oxidized core and is treated externally with a slip. From a late level of Period I.

26. Fragment of a trough-shaped vase with an externally beaded undercut rim. The illustrated example is of fine-to-medium fabric showing an incompletely oxidized core and is wet-smoothed. From an early level of Period I.

27. Fragment of a vase of red ware with an out-turned rim and long concave neck. The illustrated example is of fine fabric showing an oxidized brick-red core and is wet-smoothed. From a mid-level of Period I.

28. Rim-fragment of a vase of red ware showing an out-curved angle. The illustrated example is of fine-to-medium fabric showing an unoxidized smoky core and is treated externally with a red slip. From the same level as above.

29. Fragment of a vase of red ware with an externally beaded rim and a vertical neck. The illustrated example is of fine fabric showing an incompletely oxidized core and is treated externally with a red slip. From a late level of Period I.

30. Dish of red ware with a folded rim and a carinated profile. The illustrated example is of fine fabric showing an oxidized core and is wet-smoothed. From a late level of Period I. *Variant 30a* differs from the above in having a nail-head rim and thickened base. The illustrated example is of fine-to-medium fabric showing a brick-red core and is treated both externally and internally with a red slip. From a mid-level of Period I.

(vii) *Graffiti*

Attention has already been drawn towards the desirability of closer observation of the graffito-marks occurring on the pottery of the protohistoric period.[1] Recent studies[2] have revealed that some of the marks are common to the pottery of the Harappan, the post-Harappan chalcolithic and the more familiar peninsular megalithic cultures, quite a few, however, being peculiar to the each assemblage. Whereas the continuance of some marks through the two millennia of the life of these cultures may not be without significance, their ' language ' still remains elusive.

At Prakash ten different marks, four of them incomplete, were recorded on the pottery of Period I. Of these, six (fig. 19, *1* to *6*) were found on the white-painted black-and-grey or plain grey ware (above, p. 33), one (fig. 19, *7*) on the black-painted red Malwa Ware (above, p. 44) and the remaining three (fig. 19, *8* to *10*) on the black-painted red Jorwe Ware (above, p. 54). The incidence of the graffito-marks was, however, not appreciably large. It will be seen, therefore, that the occurrence of these marks was not confined to a single isolated industry but was current during the period, apparently in response to some meaningful tradition.

All the recorded symbols are listed below. Of these, symbols *1* and *3* are also known on the megalithic pottery, while symbols *4* and *8* are common to the megalithic pottery on the one hand and the Harappan on the other, the latter appearing even on the pottery of the pre-Harappan phase at Kalibangan. Symbol *2* is so far reported from this assemblage only. The resemblances of *5*, *6* and *10* are only rudimentary.

[1] B. K. Thapar, ' Maski 1954: a chalcolithic site of the southern Deccan ', *Ancient India*, no. 13 (1957), pp. 86-88.

[2] B. B. Lal, ' From the megalithic to the Harappan: tracing back the graffiti on the pottery ', *Ancient India*, no. 16 (1960), pp. 4 ff.

Fig. 19

1. Four bisected triangles with their apexes meeting to enclose a diamond; Lal's symbol *6* (variant). On the underside of a pot of white painted grey ware (fig. 5, *6*). Variants have additional bisecting lines.

2. Branching trident-like indented lines; Lal's symbol *58.* On the outside walls of a pot of similar fabric as above (fig. 5, *7*).

3. Lines radiating from a small circle probably representing sun as on punch-marked coins; Lal's symbol *17.* On the underside of the pot of similar form but of black-and-grey fabric.

4. Incomplete, showing obliquely incised lines crossing each other beside two parallel lines; Lal's symbol *11.* On the outside walls of a pot of similar fabric as above.



Fig. 19. *Graffiti on the pottery from Period I:* 1, 2, 5 *and* 6 *white-painted grey ware;* 3 *and* 4, *white-painted black-and-grey ware;* 7, *black-painted red Malwa Ware*; 8-10 *black-painted red Jorwe Ware*

5. Narrow-angled crossed lines beside a carelessly incised loop; Lal's symbols *11* and *20.* On the underside of a pot of plain grey ware.

6. Three intersecting lines, the vertical one showing tine-like extensions. On the underside of the pot of similar fabric as above.

7. Incomplete. On the underside of a dish of black-painted red Malwa Ware (fig. 9, *32*).

8. Arrows, incised as fillers in a painted design; Lal's symbol *5*. On the shoulder of a pot of black-painted red Jorwe Ware (fig. 14, *28*, pl. XVI, *10*).

9. Incomplete, showing indented lines, possibly converging. On the shoulder of a pot of similar fabric as above.

10. Incomplete, showing multiple intersecting lines. On the underside of a concave-sided bowl of similar fabric as above.

C. Period II

(i) *The black-and-red ware*

This ware has, during the past decade, assumed a wider meaning than hitherto ascribed. From a complacent cultural label, the 'Iron Age pottery',[1] normally associated with the megalithic burials, it is now found to be a perfected ceramic tradition with a range of occurrence extending from the Harappan contexts in Gujarat through post-Harappan chalcolithic assemblages in western and central India including the intriguing white-painted Ahar Ware of south Rajasthan or the fertile Banas valley and the pre-N.B.P. Ware horizons of the Ganga plains and Orissa to the more familiar and affluent megalithic culture of the peninsula.[2] The published assertion that the ware does not occur in the Yamuna-Ganga *doab*[3] no longer holds good in view of the findings at Hastināpura, Rupar, Alamgirpur and Atranjikhera and, more recently, further east in the sprawling plains at Rajghat, Sohagaura, Prahladpur, Chirand, Sonpur and Pandu-rajar-dibi.[4] Such a distribution, both in space and time, poses problems of origin. Is the occurrence of this ware in different chronological horizons a manifestation purely of a technique without cultural implications or is it unitary and necessarily a continuum of a persistent culture-trait? Partly integral with these suppositions is the problem of the advent of iron in India.

The basic technique of this ware, viz. the inverted firing, producing the characteristic black-and-red effect, is a widespread ceramic trait. It was known in ancient Egypt, first in the fourth millennium B.C. in the pre-Dynastic Tasian, Badarian and Nagada Periods[5] and later, as revealed by recent excavations near Tumas in Nubia, in the second millennium B.C. in cemeteries of the C-group people. A suggestive but as yet inconclusive evidence points to an early relationship between Egypt and India.[6] The possibility needs serious attention although the available Indian evidence does not help to identify all the traits. In India, the general trend of the accumulating evidence points to the homogeneity of the black-and-red ceramic industry of the pre-iron and the iron-using cultures in central and western India, and that of the megalith-builders of the Deccan and south India. Its relationship with similar ware from the Ganga plains and Orissa, as indeed the specific stages of transmutation through different cultural patterns,

[1] R. B. Foote, *Catalogue of the Prehistoric Antiquities* (Madras, 1901), pp. iii-xix.

[2] Subbarao, *op. cit.* (1958), pp. 173-79, and 'Megalithic problem of south India and the Dravidian languages', *Silver Jubilee Volume, The Archaeological Society of South India* (Madras, 1962), pp. 132-51; also Thapar, *op. cit.*, pp. 64 and 65.

[3] Wheeler, *op. cit.* (1959), p. 166.

[4] *Indian Archaeology 1961-62—A Review* (1962), pp. 59-61.

[5] V. Gordon Childe, *New Light on the Most Ancient East* (London, 1954), pp. 33, 34, 43, 44 and 58.

[6] 'Nile excavations, Indian team's finds', *Link, Indian News Magazine*, 4, no. 51, July 29, 1962, p. 39; B. B. Lal, 'The only Asian expedition in threatened Nubia, work by an Indian mission at Afyeh and Tumas', *Illustrated London News*, April 20, 1963, p. 579.

remain unresolved.[1] In the present state of uncertainty, however, the qualifying appellation ' megalithic ' for the ware found at Nagda, Maheshwar and Bahal is not to be commended.[2]

The black-and-red ware of Prakash belongs to an iron-using assemblage and its use well preceded the appearance at the site of the Northern Black Polished Ware. It is entirely wheel-thrown and shows a slight lustre, resulting perhaps from soft cloth or leather burnishing or polishing. Individual burnishing-strokes, as normal with a stone burnisher, are absent. The smoothed surface may alternatively have resulted from effective wet-smoothing by which the finer clay particles are floated out to the surface. There are no indications of salt-glazing. The texture of the paste employed is dense with sparse-to-medium concentration of the inclusions which consist of fine minerals and some vegetable-matter. It takes a straight but rough fracture. Comparatively low-fired in the characteristic inverted-firing techinique, it often shows unoxidized or incompletely oxidized sections in the core. Abrasions or spallings, though by no means a regular feature, are noticed in a few examples.

The shapes represented are very rudimentary and comprise the bowl, the dish and the small-sized vase. Of these, the thin-sectioned bowl with a multigrooved profile (fig. 20, *2b*) is of unusual interest. None of the types, however, is a specialized one to afford closer and significant parallels with other sites. No pot bearing graffito-marks was found in the present collection.

This ware forms 34·83 per cent of the total yield of pottery from Period II. Starting as a fully-developed dominant industry with 55·48 per cent distribution in the lowest level, it shows a consistent decrease upwards till the distribution percentage falls to 9·09 in the topmost level.

The following select types are illustrated.

Fig. 20

1. Bowl of black-and-red ware with a vertical thinned rim and possibly a convex base. The illustrated example is of medium fabric showing a smoky core, is treated with a self-slip and has burnt black-and-red in the characteristic manner showing black inside and black-and-red outside with black confined to the upper portion.[3] From an early level of Period II. *Variant 1a*, of the same fabric as above, differs in having a flattish base. The surface shows some abrasions. The illustrated example is from an early level of the Period. *Variant 1b*, of the same fabric as above, has in the lower half thicker convex sides and a flat base. The illustrated example is from a mid-level of Period II.

2. Bowl of black-and-red ware with a thin imperceptibly grooved rim and convex sides. The illustrated example is of finer fabric showing an incompletely oxidized core and is self-slipped or wet-smoothed. From a mid-level of Period II. *Variant 2a*, a complete example, differs from the above in having a flat base. The illustrated example is of a medium fabric showing incompletely oxidized core and is wet-smoothed. From an unstratified deposit of the Period. *Variant 2b* is distinguished by a thinner section, externally multigrooved sides carinated to a convex base. The illustrated example is from the earliest level of Period II.

[1] Wheeler, *op. cit.* (1959), pp. 166-67; also Subbarao, *op. cit.* (1962), p. 135 and 'The problem of the black-and-red wares of northern India', read at the International Conference on Asian Archaeology, New Delhi, 1961. Also Soundara Rajan, *op. cit.*, and Adris Banerji, 'Problem of black-and-red ware', *Man in India*, 44, no. 4 (Oct.-Dec. 1964), pp. 341-53.

[2] Wheeler, *op. cit.* (1959), pp. 139-45.

[3] Unless otherwise mentioned, the fabric of the black-and-red ware listed here is of an unvarying nature.

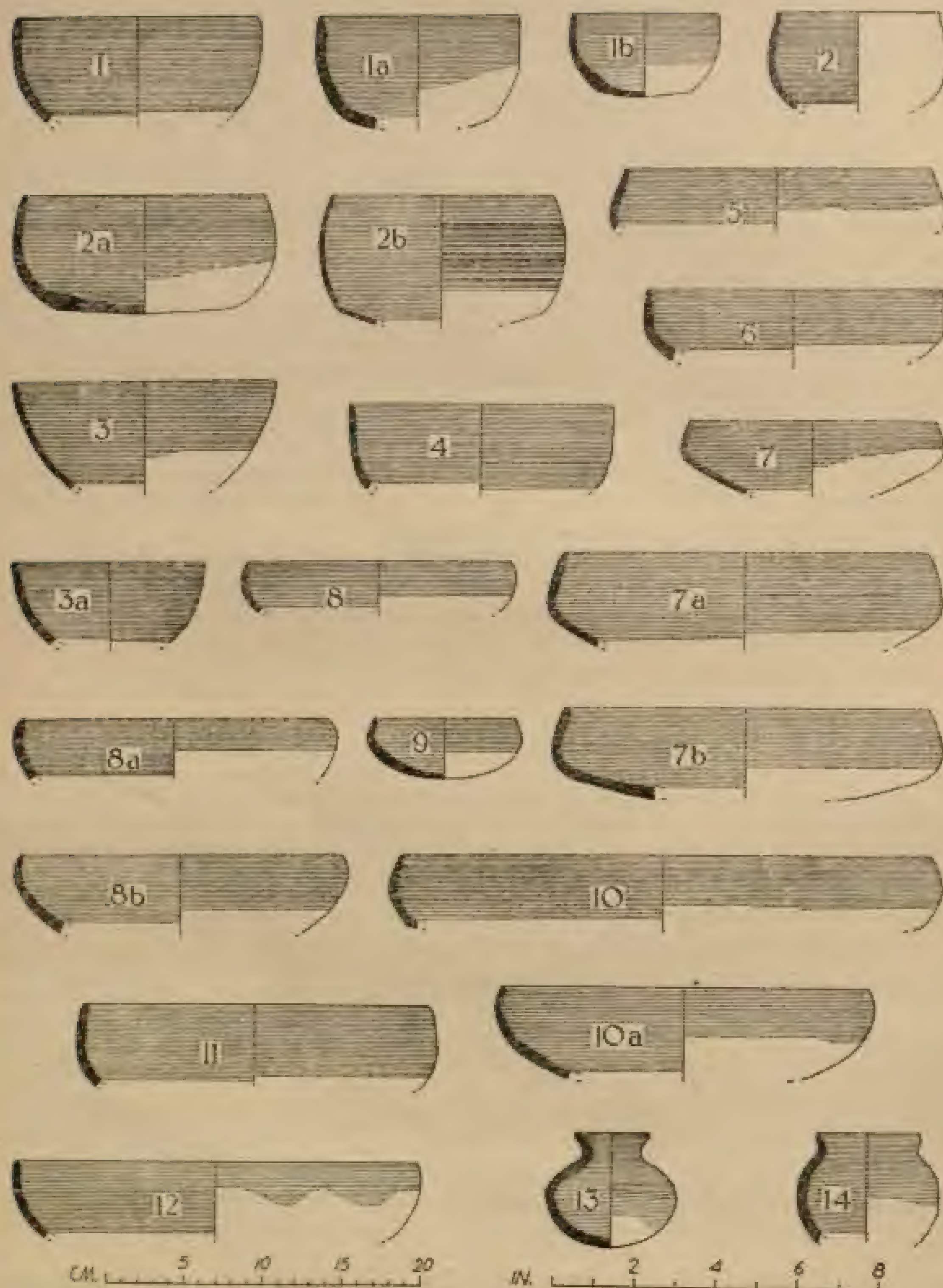


FIG. 20. *Pottery from Period II: black-and-red ware*

3. Bowl of black-and-red ware with a featureless rim and tapering sides. The illustrated example is of finer fabric showing an incompletely oxidized core and is wet-smoothed. From a mid-level of Period II. *Variant 3a* differs in having a thicker section. The illustrated example is from the overlapped levels of Periods II and III.

4. Bowl of black-and-red ware with a vertical thinned rim and sides externally grooved at mid-height. The illustrated example is of comparatively fine fabric showing a smoky core and is treated with a slip. From an early level of Period II.

5. Dish of black-and-red ware with a closing featureless rim and sides bluntly carinated at the junction with the base. The illustrated example is of medium fabric showing an incompletely oxidized core and is wet-smoothed. From a late level of Period II.

6. Bowl of black-and-red ware with a vertical thinned rim and sides bluntly carinated to a convex base. The illustrated example is of medium fabric showing an incompletely oxidized core and is self-slipped. From a mid-level of Period II.

7. Bowl of black-and-red ware with a slightly closing featureless rim and sides bluntly carinated to a convex base. The illustrated example is of medium fabric showing an incompletely-oxidized core and is self-slipped. From an early level of Period II. *Variant 7a*, a larger example, is from the overlapped levels of Periods II and III. *Variant 7b*, a dish of the same fabric as above, has an imperfectly-flat base. The illustrated example is from a mid-level of Period II.

8. Bowl of black-and-red ware with a featureless rim and in-curved sides. The illustrated example is of medium fabric showing an incompletely oxidized core, and is self-slipped. From the earliest level of Period II. *Variant 8a*, of the same fabric as above, differs from the above in being deeper. The illustrated example is from an unstratified deposit belonging to the Period. *Variant 8b*, of the same fabric as above, differs from the main type in having a rounded profile notably towards the lower part. The illustrated example is from an early level of Period II.

9. Miniature bowl of black-and-red ware with an in-turned thinned rim, thickened convex sides and a flattish base. The illustrated example is of medium fabric showing an incompletely oxidized core, and is self-slipped. From a mid-level of Period II.

10. Dish of black-and-red ware with an in-turned thinned rim, convex, imperceptibly faceted, sides carinated at the junction with a flattish base. The illustrated example is of medium fabric showing incompletely oxidized core and is treated with a self-slip. From the earliest level of Period II. Similar dishes are also available in the all-black fabric. *Variant 10a* is a bowl form and differs from the above in being deeper and having possibly a convex base. The illustrated example is of the same fabric as above. From an early level of Period II.

11. Dish of black-and-red ware with a featureless rim and slightly convex sides. The illustrated example is of medium fabric showing incompletely-oxidized core and is self-slipped. From a late level of Period II.

12. Dish of blotchy black-and-red ware with a rounded profile. The illustrated example is of medium fabric showing oxidized core and has burnt darkish on the inside and is treated with a self-slip. From the overlapped levels of Periods II and III.

13. Vase of black-and-red ware with an out-curved featureless rim, short concave neck and globular body, grooved at mid-height. The illustrated example is of medium fabric showing unoxidized smoky core and is treated externally with a self-slip. The surface shows spallings. From a mid-level of Period II.

14. Vase of black-and-red ware with a short out-turned rim, comparatively wider mouth than that of *13* above, and a rounded profile. The illustrated example is of the same fabric as above, and is treated externally with a self-slip. From a late level of Period II.

(ii) *The Northern Black Polished Ware*

This patent steel-like glossy Ware has, during the last decade, been obtained under closely-observed conditions from a large number of explored and excavated sites, of which the peripheral ones like Charsada near Peshawar and Udegram in Swat in the north,

DISTRIBUTION OF NORTHERN BLACK POLISHED WARE

FIG. 21

Tilaura-kot in the Napalese *tarai*, Prabhas-Patan on the Kathiawar littoral in the west, Ujjain, Maheshwar and Nasik on the trunk-route from the Ganga-Yamuna *doab* to the Arabian sea, Ter and Brahmapuri in the Deccan, Kaundanpur (ancient Kauṇḍinyapura), Eran and Tripurī in the central part of India, Chandraketugarh and Berachampa in the east and Chebrolu, farther south of the famous Buddhist site of Amaravati in the south are particularly noteworthy. The present-day distribution of the Ware (fig. 21) somewhat belies the christened geographical extent—northern.

Similarly, black is not the exclusive colour in which this high-grade Ware was produced; other hues achieved were steel-blue, chocolate, orange and golden. Instances of double colour,[1] one for the outside and the other for the inside are also known. Besides, a diversified painted variety showing linear designs in pinkish creamy mat pigment over the glossy surface[2] has also been recorded.

The distinctive fabric of this Ware has already been described in the earlier issues of *Ancient India*[3] and need not be repeated here. Attention, however, may be drawn to the recent investigations by the laboratories of the British Museum and the M.S. University of Baroda[4] into its elusive method of manufacture.

According to the observation of the British Museum laboratory, the Ware was not subjected to elaborate rubbing or burnishing as previously thought.[5] 'Microscopical examination of the ridged areas showed that the shiny surface is not confined to the raised parts, but its appearance may be related to some characteristic of the material used for the surface layer as found to be the case with the Greek black gloss. There are, however, several differences between the two. When held near the magnet, Greek black is attracted to the magnet, whereas Indian black is relatively non-magnetic. The surface of the N.B.P. Ware differs from Greek black gloss in its behaviour when fired. The latter is consistently stable at temperatures of *c.* 1000°C, whereas the samples of the N.B.P. Ware have shown variations in their resistance to such temperatures'. About the surface-layer, although its precise nature still remains to be determined, it could be inferred 'that the unfired pots were dipped in a suspension of ferruginous inorganic material[6] probably resembling a red earth; and that, after firing to a temperature of *c.* 800°C, the kiln was sealed so that the pots cooled in a reducing atmosphere'.

The analysis of the laboratory of the M.S. University of Baroda, is, however, at variance with the above findings, especially in regard to the magnetic quality of the slip. According to its investigations, 'when a very small fragment of the slip was held near a magnet, it was attracted by the magnet, while a similar fragment of the body was found to be relatively less magnetic'. The shiny black slip was found to be produced by an application of a carefully-sifted liquid clay, peptized by the addition of an alkaline material which combined with alumina and silica of the clay forms liquids at low temperature and

[1] Author's own observations at Kauśāmbī.

[2] *Indian Archaeology 1958-59*, pp. 2 and 47, pl. LVI; *ibid., 1960-61*, p. 37, fig. 10, *14*, pl. LXII A; Sharma, *op. cit.*, p. 59 and fig. 15.

[3] *Ancient India*, no. 1, pp. 55-58; *ibid.*, nos. 10 and 11 (1954-55), pp. 50-52.

[4] Wheeler, *op. cit.* (1959), pp. 30 and 180, n. 7, quoting from the analysis by Miss Bimson; also *op. cit.* (1962), p. 41; Karunakara Hegde, 'Technical studies in Northern Black Polished (N.B.P.) Ware', *Jour. M. S. University, Baroda* (Humanities), XI, no. 1 (April 1962), pp. 159-61.

[5] *Ancient India*, no. 4 (1947-48), p. 208, n. 4.

[6] According to the analysis of the Archaeological Chemist in India, 'the lustre on the surface of the Ware appears to be composed of some easily-fusible material, possibly of organic origin, which undergoes incipient fusion at a low heat'. *Indian Archaeology 1955-56*, pp. 56-57.

thus 'imparts imperviousness and strength to fired clay bodies, besides the glaze-like gloss on their surface'. The mineralogical identity of such an alkaline material is suggested with *sajji matti*, *reh* or *khari*, abundantly found in the Ganga plains, which significantly enough is the central zone of diffusion of this Ware. From the crazing tendency of the slip, resulting from the higher coefficient of thermal expansion than the body, it was inferred that the surface-dressing was applied on baked clay.[1]

From the above showing it is apparent that the christened attribute *polished* is no longer true for this Ware. In the present position of uncertainty, however, a plea is made to retain the established name 'Northern Black Polished Ware'[2] even though it may sound to be an incorrect description.

As to the date of this Ware, apart from the various C-14 determinations there is comparatively little that is new. The Taxila evidence still forms the basis of all ascriptions. At Hastināpura and Kauśāmbī in Ganga-Yamuna basins, the initial date of the Ware was placed in the early sixth century B.C.[3] The validity of this date has, however, been disputed by some archaeologists who instead prefer a date somewhere in the fifth century B.C.[4] It is relevant to add that the recent C-14 dates from the N.B.P. Ware horizons at Rajgir, Hastināpura, Kauśāmbī, Ahichchhatrā, Atranjikhera, Rajghat, Hetimpur, Rupar and Besnagar[5] (below, pp. 161-65) have also not indicated any date prior to *circa* 500 B.C. for the lower limit of this Ware. By *circa* second century B.C., the Ware seems to have passed out of active use as shown by the coins of the corresponding period in the overlying levels at Hastināpura and Vaiśālī. At Kauśāmbī and Hetimpur, however, a somewhat longer duration is suggested. Its occurrence in later levels, admittedly in very small numbers, along with the Rouletted Ware at Sisupalgarh[6] and in the shape of caskets at Chandraketugarh[7], only indicates chance survival as a treasured fabric or an imitation, possibly in relatively baser fabric. The Ware had its roots in the formative period and traded wherever the Mauryan influence was felt. Thus, its extensions in the peripheral areas in western, eastern and southern India may perhaps coincide with the expansion of the organized Mauryan Empire and the developed urbanity of the northern plains. The evidence at Maheshwar, Bahal, Prabhas-Patan, Chandraketugarh, Ter and Amaravati is consistent with the above premise and need not be retraversed here.

At Prakash, only ten sherds of this Ware, occurring in the upper four levels (37, 36 and 34) of Period II, were found. The number of sherds is admittedly too small to

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[1] Possibilities of peptization and double firing were also hinted previously. Cf. *Ancient India*, nos. 10 and 11, p. 51.

[2] Wheeler, *op. cit.* (1962), p. 42.

[3] *Ancient India*, nos. 10 and 11, pp. 23 and 52 and G. R. Sharma, *op. cit.*, p. 23. A similar fabric, possibly the same (N.B.P.) Ware, was dated by Marshall at Bhita to *circa* eighth century B.C., *Ann. Rep. Arch. Surv. Ind.* 1911-12 (Calcutta, 1915), pp. 80-81.

[4] D. H. Gordon, 'The pottery industries of the Indo-Iranian border', Ancient India, nos. 10 and 11, p. 175; also *Pre-historic Background of Indian Culture* (Bombay, 1958), pp. 140-52 and 165-70; Wheeler, *op. cit.* (1959), p. 30-31; also *op. cit.* (1962), pp. 41-46.

[5] Kusumgar, Lal and Sarna, *op. cit.*, pp. 280-81; D. P. Agrawal, S. Kusumgar, D. Lal, and R. P. Sarna, 'Tata Institute radiocarbon date list II', *Radiocarbon*, 6 (1964), pp. 227-31; D. P. Agrawal, S. Kusumgar and R. P. Sarna, 'Radiocarbon dates of archaeological samples', *Current Science*, 33, no. 2 (Jan. 1964), pp. 40-42; *ibid.*, 33, no. 9 (May 1964), 267-69 and D. P. Agrawal and S. Kusumgar, 'Radiocarbon dates of some neolithic and early historic samples', *Current Science*, 34, no. 2 (Jan. 1965), pp. 42-43.

[6] *Ancient India*, no. 5 (1949), pp. 68 and 79.

[7] *Indian Archaeology 1961-62*, p. 63.

build a chronological structure. In the general sequence, however, they can be ascribed to *circa* third-second century B.C., perhaps surviving into the first, the *terminus ad quem* being provided by the occurrence of two coins of tribal Ujjayinī type in layer 31, 2¼ ft. above the latest find of the Ware. It is relevant to add that in the present cutting a few examples of the pear-shaped vase (fig. 26, *40*), the miniature bowl with in-curved rim (fig. 23, *1a*) and the carinated *hāṇḍī* (fig. 26, *41*), normally associated with the N.B.P. Ware types in the Yamuna-Ganga basins, occurred in the two layers preceding the lowest find of the N.B.P. Ware. Since these common, though typical, forms would have reached Prakash only with the trade (N.B.P.) Ware and not earlier, it is reasonable to infer that the horizon of the N.B.P. Ware at the site may be, somewhat lower than that revealed by the evidence in the present cutting. This, however, would not appreciably alter the chronological framework.

The following is a list of the illustrated examples.

Fig. 22

1. Bowl of steel blue-colour with a vertical featureless rim and slightly expanding sides carinated to a flattish base. From a late level of Period II, being the lowest occurrence in the section.

2. Deep bowl of shiny black colour with a thickened externally bevelled rim and semi-circular profile. From an unstratified deposit. *Variant 2a*, of red colour, is of thinner section and comes from a late level of the Period.

3. Shallow bowl of steel-blue colour with a slightly internally-thickened rim. From the same level as above.

4. Bowl with a featureless rim, convex sides and rounded profile. The uppermost shiny black layer has mostly flaked off exposing the mat grey undersurface. From surface-collection.

5. Bowl of steel-blue colour with a featureless rim and expanding sides, weakly carinated at the junction with the base. From a late level of Period II.

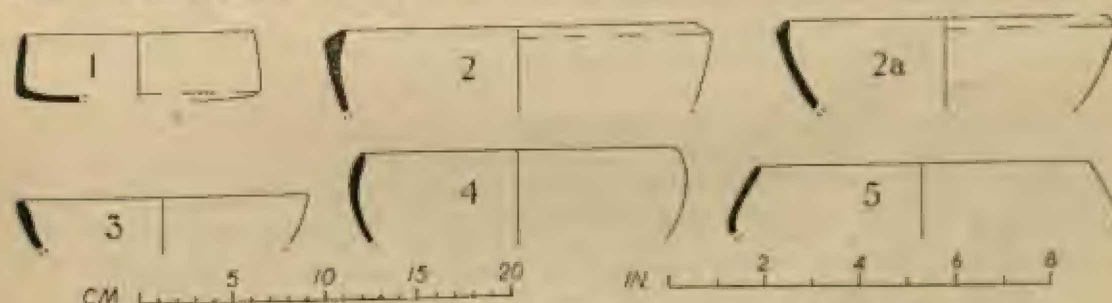


Fig. 22. *Pottery from Period II: Northern Black Polished Ware*

(iii) *Other wares*

The pottery included under this class is mostly of red ware, the only exception being a few pots of darkish-grey ware (fig. 23, *5* and *5a*; fig. 24, *17*, *19a*, *21* and *23*; and fig. 25, *24*). The entire range, however, is wheel-made. In the main, two fabrics were met with: (a) blotchy-red ware, often showing a plum-red hue, and (b) red ware essentially of light colour.

Of these, the former, though less prolific, is more distinctive. Its surface-colour shows shades of dull plum-red with occasional abrasions of the surface-dressing. The paste is

dense, often vesiculated, showing medium-to-heavy concentration of the inclusions comprising quartz minerals, and takes an irregular fracture. It is relatively low-fired and often shows an unoxidized smoky core. The range of shapes available is limited to the frying-pan or *kaṛāhī*, sometimes with ring-handle (fig. 23, *13* and *14*), basin (fig. 24, *15*) and medium-sized vase (fig. 25, *26* and *27* and fig. 26, *42*). The presence of soot-marks on the lower part of the *kaṛāhīs* confirms their use as cooking-vessels. It is relevant to mention that the paste seems to have been specifically prepared, as tempering with non-plastic quartz minerals would counteract shrinkage or cracking during firing. Similar fabric was also noticed at Ujjain and Nagda, commencing with the pre-N.B.P. Ware iron-using milieu and thereafter continuing in the subsequent N.B.P. Ware phase[1]. Its occurrence at Prakash, throughout the occupation of Period II, is, therefore, consistent with the findings at these sites.

The fabric of the second variety is not so characteristic as the one described above. The surface-colour ranges from drab to light-red. The surface-dressing, wherever present, is either a self-slip or a wet-smoothing, examples of true slip being very rare. Most of the pots, however, are without any surface-treatment. The texture of the paste is generally dense with sparse-to-medium concentration of the inclusions comprising fine minerals and produces a rough fracture. The ware is fired at a medium temperature and sometimes shows a darkened unoxidized core. In the general repertory of the vessels of this fabric, the occurrence of the small-sized bowl (fig. 23, *1a*), lid (fig. 23, *8* and *8a*), dish (fig. 23, *10a*), pear-shaped vase (fig. 26, *40*) and carinated *hāṇḍī* (fig. 26, *41*) is particularly noteworthy inasmuch as all of these are commonly met with in association with the N.B.P. Ware on sites in the northern plains.[2] In the present excavation, however, the occurrence of the *hāṇḍī* and the pear-shaped vase was also recorded in the two layers preceding the lowest find of the N.B.P. Ware. Amongst other types, the bowl (fig. 23, *3*, *9*, *11* and *12*) and the vase (fig. 25, *30-38*) may be considered as typical of this fabric.

The ware forms 64·83 per cent of the total yield of pottery from Period II. The percentage distribution shows a consistent increase from 44·51 in the lowest to 90·90 in the top level. In the lower levels itself, it had started dominating the other associated industry, viz. the black-and-red ware (above, pp. 68-69).

Figs. 23-26

1. Bowl of dull-red ware with a slightly in-curved rim and flat string-cut base. The illustrated example is of medium fabric showing an unoxidized core in the mid-section and is devoid of any surface-treatment. From a mid-level of Period II. *Variant 1a* differs in having a short vertical featureless rim and affords the closest parallels with corresponding forms at Hastināpura. The illustrated example is of medium-to-fine fabric showing a fully oxidized core and is devoid of any surface treatment. From an early level of Period II.

2. Bowl of red ware with splayed-out sides and a string-cut disc-base. The illustrated example is of medium-to-fine fabric showing an oxidized brick-red core and seems to be wet-smoothed. From a mid-level of Period II.

3. Bowl of red ware with a vertical internally thinned rim and almost straight sides. The illustrated example is of medium fabric showing an unoxidized smoky core in the mid-section and is burnished, showing a slight sheen. From the earliest level of Period II.

4. Bowl of red ware with a vertical featureless externally-grooved rim, slightly convex sides and a flat base. The illustrated example is of medium fabric showing an unoxidized smoky core in

[1] *Indian Archaeology 1956-57*, p. 24 and fig. 12; also Wheeler, *op. cit.* (1959), p. 144.
[2] *Ancient India*, nos. 10 and 11, p. 53.

the mid-section and is burnished externally. From a mid-level of Period II. *Variant 4a*, of the same fabric as above, differs in having a less pronounced grooved rim and a rounded profile. The illustrated example is from a mid-level of the Period. *Variant 4b* is deeper than the preceding sub-type and shows a fully unoxidized smoky core. The illustrated example is from the same level as the main type.

5. Bowl of dull-grey ware with a featureless rim, convex sides and presumably a rounded base. The illustrated example is of medium fabric showing an unoxidized smoky core and is burnished externally. From a late level of Period II. *Variant 5a*, of the same darkish grey ware fabric as above, differs in having a semi-circular profile. The illustrated example is from a late level of Period II.

6. Small-sized lid of red ware with splayed sides and string-cut disc-base. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From a late level of Period II.

7. Lid or shallow container of drab ware with slightly narrowing sides and a flat base. The illustrated example is of coarse fabric showing an unoxidized smoky core and vesiculated paste. From an early level of Period II.

8. Lid of dull-red ware with a short vertical lip externally recurved for a horizontal flange and a convex base. The illustrated example is of medium fabric showing an oxidized red core and devoid of any surface-treatment. From the overlapped levels of Periods II and III. *Variant 8a*, of the same fabric, is deeper and has a more pronounced rim. The illustrated example is from a mid-level of Period II.

9. Bowl of red ware with a vertical featureless rim, slightly convex sides and a sagger base. The illustrated example is of the same fabric as above. From a mid-level of Period II.

10. Dish of red ware with a slightly closing thinned rim, carinated profile and presumably a convex base. The illustrated example is of medium fabric showing an oxidized core and is wet-smoothed. From a late level of Period II. *Variant 10a* differs from the above in having uniformly thick concave sides. The illustrated example is of fine fabric showing an oxidized red core, is polished and is self-slipped externally. From a mid-level of Period II.

11. Bowl or basin of red ware with an almost vertical featureless rim with an appreciable ledge at the junction with the rounded sides. The illustrated example is of medium fabric showing an oxidized brick-red core and is self-slipped internally. From the overlapped levels of Periods II and III. *Variant 11a* differs from the main type in having an external cordon and slightly thinner sides. The illustrated example is of the same fabric as above and is slipped both externally and internally. From a late level of Period II.

12. Bowl of red ware with an in-curved featureless rim and sides distinguished by an applied band of finger-tip decorations. The illustrated example is of medium fabric showing an oxidized core and is polished or burnished externally subsequent to a self-slip. From a late level of Period II.

13. *Kaṛāhī* of drab ware with a splayed-out rim, carinated neck, convex shoulders and a low girth with carinated profile. The illustrated example is of medium fabric showing an unoxidized core at places and is self-slipped both externally and internally and thereafter burnished externally. The paste is vesiculated. The soot-marks on the underside indicate its function as a cooking-pot. From a late level of Period II. *Variant 13a* differs from the above in having a weakly-carinated profile. The fabric of the illustrated example is also less vesiculated. From an early level of Period II. *Variant 13b*, of the same fabric as above, has a less pronounced rim and straighter sides. The illustrated example is from the earliest level of Period II. *Variant 13c* differs from the above in the angle of the rim and the thickening of the lips as the main type and shows some abrasions. The illustrated example is of the same fabric. From an early level of Period II. *Variant 13d*, of comparatively thinner fabric, has an out-turned rim and almost vertical sides weakly carinated to a sagger base. The illustrated example is of the same fabric as *variant 13a* above, but the inner base shows abrasions. From an early level of Period II.

14. *Kaṛāhī* of drab ware, distinguished by the presence of ring-handles. The illustrated example is of medium fabric with a vesiculated paste and shows an unoxidized core in the mid-section. From a mid-level of Period II.

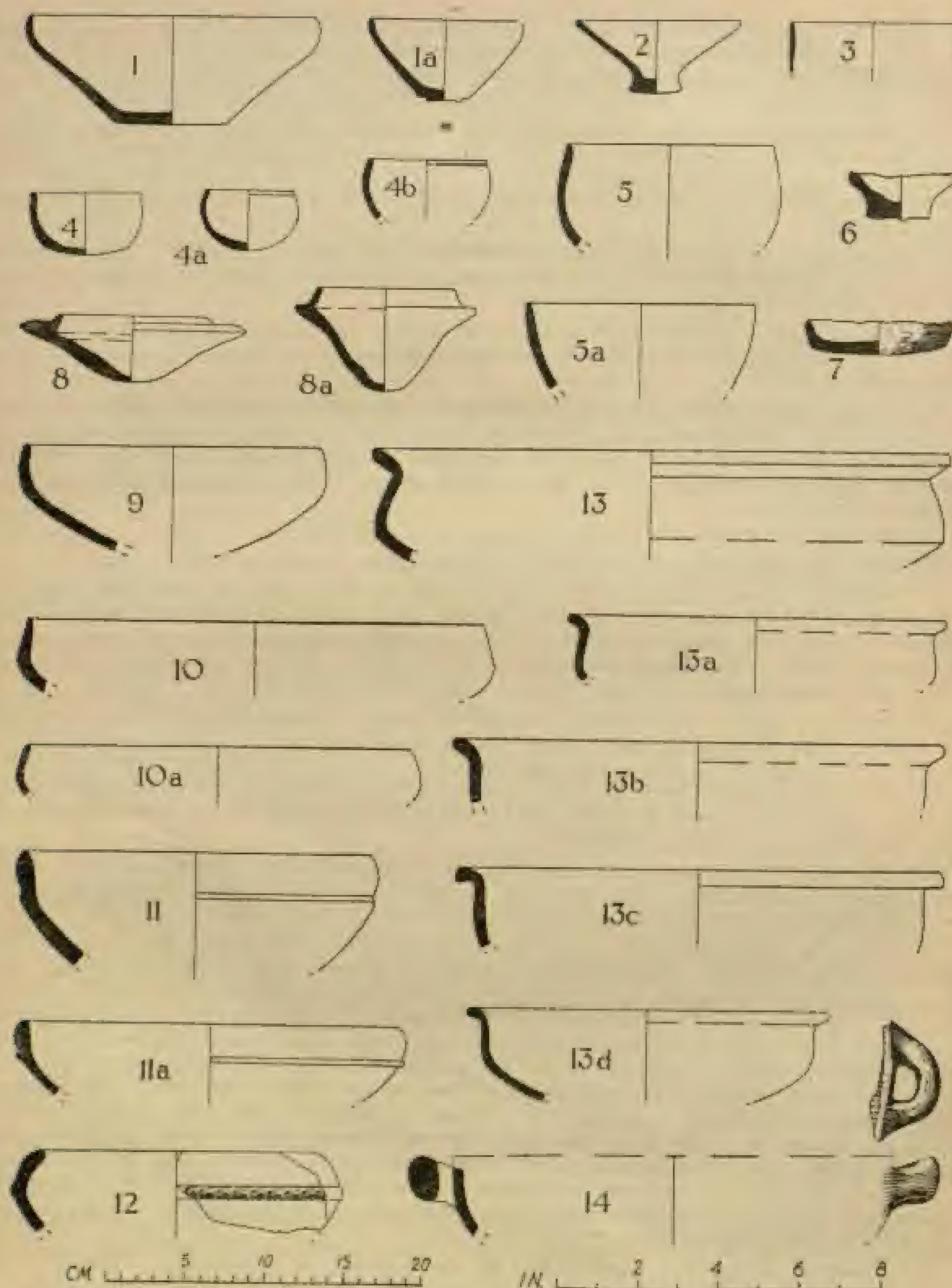


FIG. 23. *Pottery from Period II: other wares*

15. Basin of red ware with an in-curved externally elliptical-collared rim distinguished by a cordon at the shoulder and in-curved sides. The illustrated example is of medium fabric showing an unoxidized smoky core, vesiculated paste and is self-slipped both externally and internally and thereafter burnished. From an early level of the Period II. *Variant 15a* has a more in-curved rim and lacks the exterrnal cordon. The illustrated example is of medium fabric showing a partly-unoxidized core and is treated both internally and externally with a self-slip. From a late level of Period II. *Variant 15b* is distinguished by an oval-collared rim and is multigrooved on the shoulder. The illustrated example is of the same fabric as above but shows a brick-red oxidized core. From an early level of Period II. *Variant 15c* is marked by a smaller rim and a semi-circular profile. The illustrated example is of medium fabric showing unoxidized smoky core in the mid-section, is slipped both externally and internally and shows abrasions. From a late level of Period II. *Variant 15d* is characterized by a vertical oval-collared externally under-cut rim. The illustrated example is of medium fabric showing an oxidized brick-red core and is self-slipped both externally and internally. From a mid-level of Period II.

16. Deep bowl of red ware with an in-curved elliptical-collared rim. The illustrated example is of medium fabric showing an unoxidized smoky core and is self-slipped both externally and internally. From a mid-level of Period II.

17. Basin of darkish-grey ware with an in-curved externally oval-collared rim and in-curved sides. The illustrated example is of medium fabric showing a smoky core, is self-slipped and burnished both externally and internally. From a late level of Period II.

18. Basin of red ware with an out-turned featureless rim, carinated neck and in-curved sides. The illustrated example is of medium fabric showing an oxidized core and is treated with a self-slip. From the earliest level of Period II.

19. Basin of red ware with an out-turned thickened rim and a carinated neck. The illustrated example is of medium fabric showing an oxidized red core and is treated with a slip and thereafter polished. From a mid-level of Period II. *Variant 19a,* of darkish grey ware, differs from the above in having an appreciable concavity on the inner side of the rim. The illustrated example is of medium fabric showing a smoky core and is treated with a slip and thereafter polished or burnished. From an early level of Period II.

20. Deep basin of red ware with an almost vertical externally-thickened rim and convex sides. The illustrated example is of medium fabric showing unoxidized smoky core in the mid-section and is treated both externally and internally with a red slip. From a mid-level of Period II.

21. Deep bowl or basin of darkish-grey ware with a clubbed rim and in-curved sides. The illustrated example is of medium fabric showing a smoky core and is treated with a self-slip and thereafter burnished. From a late level of Period II.

22. Deep bowl or basin of red ware with a vertical externally-thickened rim and distinguished by shallow grooved in-curved sides. The illustrated example is of medium fabric showing an oxidized core and is treated with a buff pinkish slip and thereafter burnished. From an early level of Period II.

23. Basin of darkish grey ware with an almost vertical externally-thickened rim, a slender concave neck and a grooved profile. The illustrated example is of medium fabric showing a smoky core and is self-slipped and thereafter burnished. From a mid-level of period II. *Variant 23a,* of drab ware, differs from the above in having an everted externally-thickened rim. The illustrated example is of medium fabric, indifferently fired and is wet-smoothed externally. From a mid-level of Period II.

24. Vase of darkish-grey ware with a splayed-out bud-shaped rim, externally grooved, and a carinated neck. The illustrated example is of medium fabric showing a smoky core and is burnished externally. From an early level of Period II. *Variant 24a,* of red ware, differs from the above in having a flaring angle and a round nail-head rim. The illustrated example is of medium fabric showing an unoxidized smoky core and is slipped and burnished externally. From a late level of Period II. *Variant 24b,* of red ware, differs from the main type in having an externally thickened rim and a weak carination at the neck. The illustrated example is of medium fabric showing an oxidized core and is polished externally. From the same level as above.

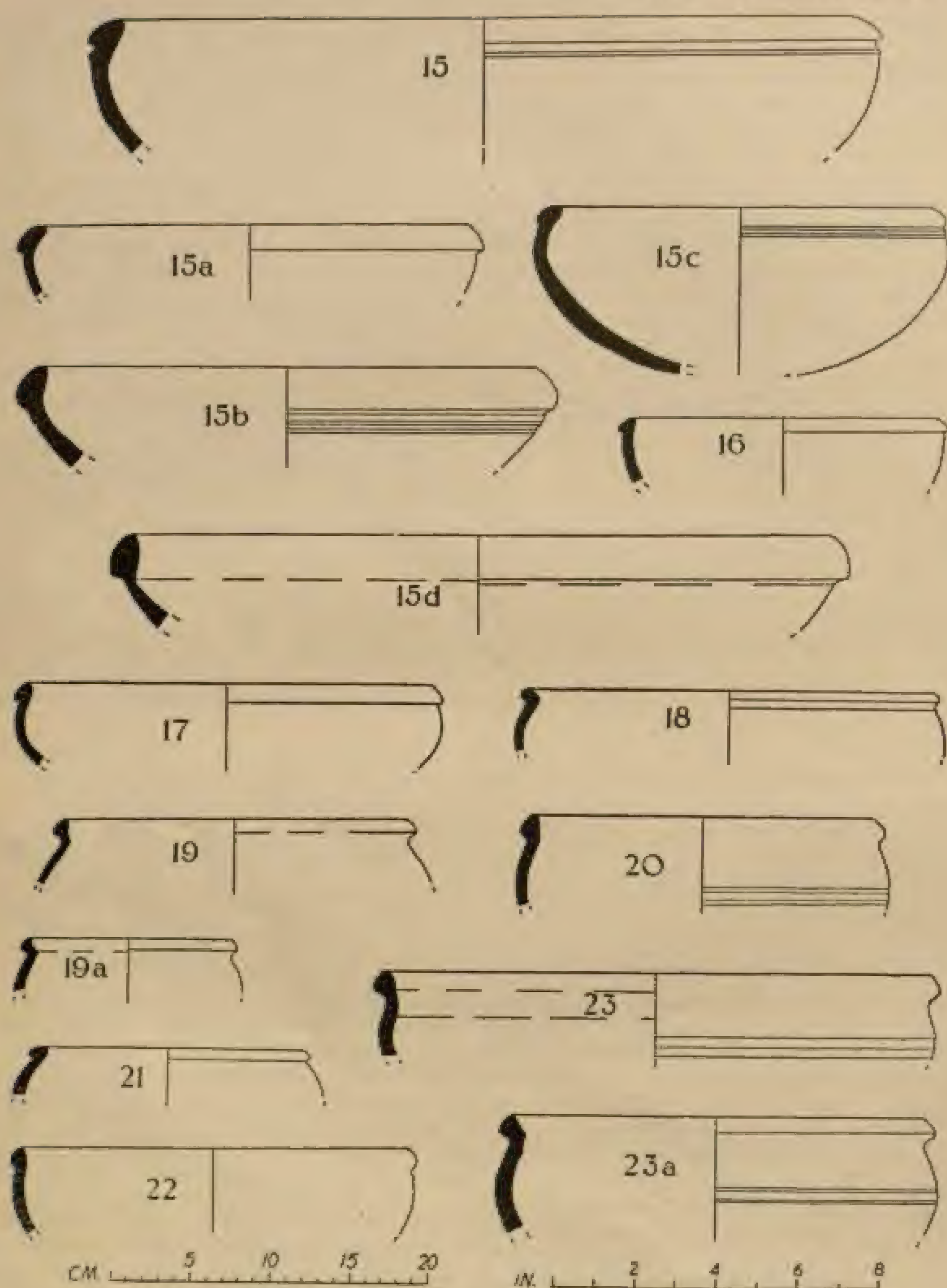


FIG. 24. *Pottery from Period II: other wares*

25. Vase of red ware with a horizontally-splayed bud-shaped rim and a concave neck. The illustrated example is of medium fabric showing an unoxidized smoky core in the mid-section and is treated with a slip and thereafter polished. From a mid-level of Period II.

26. Vase of drab ware with a clubbed rim and short vertical neck. The illustrated example is of medium fabric showing an incompletely oxidized core and vesiculated paste and is treated with a red slip externally and up to the neck-portion internally. From a late level of Period II.

27. Vase of drab ware with an out-turned thickened rim and vertical neck, distinguished externally by grooves. The illustrated example is of the same fabric as above, the surface-layer showing abrasions notably on the interior. From a mid-level of Period II.

28. Vase of red ware with an out-curved bud-shaped rim. The illustrated example is of medium fabric showing an unoxidized smoky core in the mid-section and a vesiculated paste and is treated with red slip both externally and internally. From the overlapped levels of Period II and III.

29. Vase of red ware with an out-turned externally-thickened rim and a concave neck. The illustrated example is of the same fabric as *28* above. From a late level of Period II.

30. Vase of red ware with a splayed-out nail-head rim and concave neck. The illustrated example is of medium fabric showing an unoxidized smoky core and is treated with a red slip and thereafter polished to give a lustre. From an early level of Period II. *Variant 30a* differs from the above in the feature of the rim which is more thickened. The illustrated example is of the same fabric as above but is self-slipped and devoid of any polish. From a late level of Period II. *Variant 30b* differs from the main type in having a round nail-head rim. The illustrated example is of medium fabric showing an oxidized core and is burnished externally. From a late level of Period II. *Variant 30c* differs from the main type in having its rim undercut internally and a comparatively narrower neck. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From a mid-level of the period. *Variant 30d* shows a thickened rim marked by an external ridge. The illustrated example is of medium fabric showing an incompletely oxidized core, is treated with a slip externally and up to the neck internally and is polished. From a mid-level of Period II.

31. Vase of red ware with a flaring externally-thickened rim marked by grooves on the inner side. The illustrated example is of medium fabric showing an oxidized core. It is treated with a red slip and is polished. From a mid-level of Period II.

32. Vase of drab ware with an out-curved externally-thickened or round-collared rim. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From the earliest level of Period II.

33. Vase of red ware with an out-turned featureless rim and a concave neck. The illustrated example is of medium fabric showing an oxidized core and is wet-smoothed. From an early level of Period II. *Variant 33a* is distinguished by grooves on the neck, one each on the inside and the outside. The illustrated example is of the same fabric as above but is self-slipped externally. From an early level of Period II.

34. Vase of red ware with a vertical externally elliptical-collared rim and a concave neck. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From an unstratified level of Period II.

35. Vase of red ware with an in-curved internally-thickened rim, short vertical neck and oblique shoulders. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From a mid-level of Period II.

36. Miniature vase of red ware with an out-turned featureless rim, rounded sides and a flat string-cut base. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From an early level of Period II.

37. Vase of red ware with an out-curved externally triangular-collared rim, a concave neck and convex shoulders, distinguished by a groove at the junction with the neck. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From a late level of Period II.

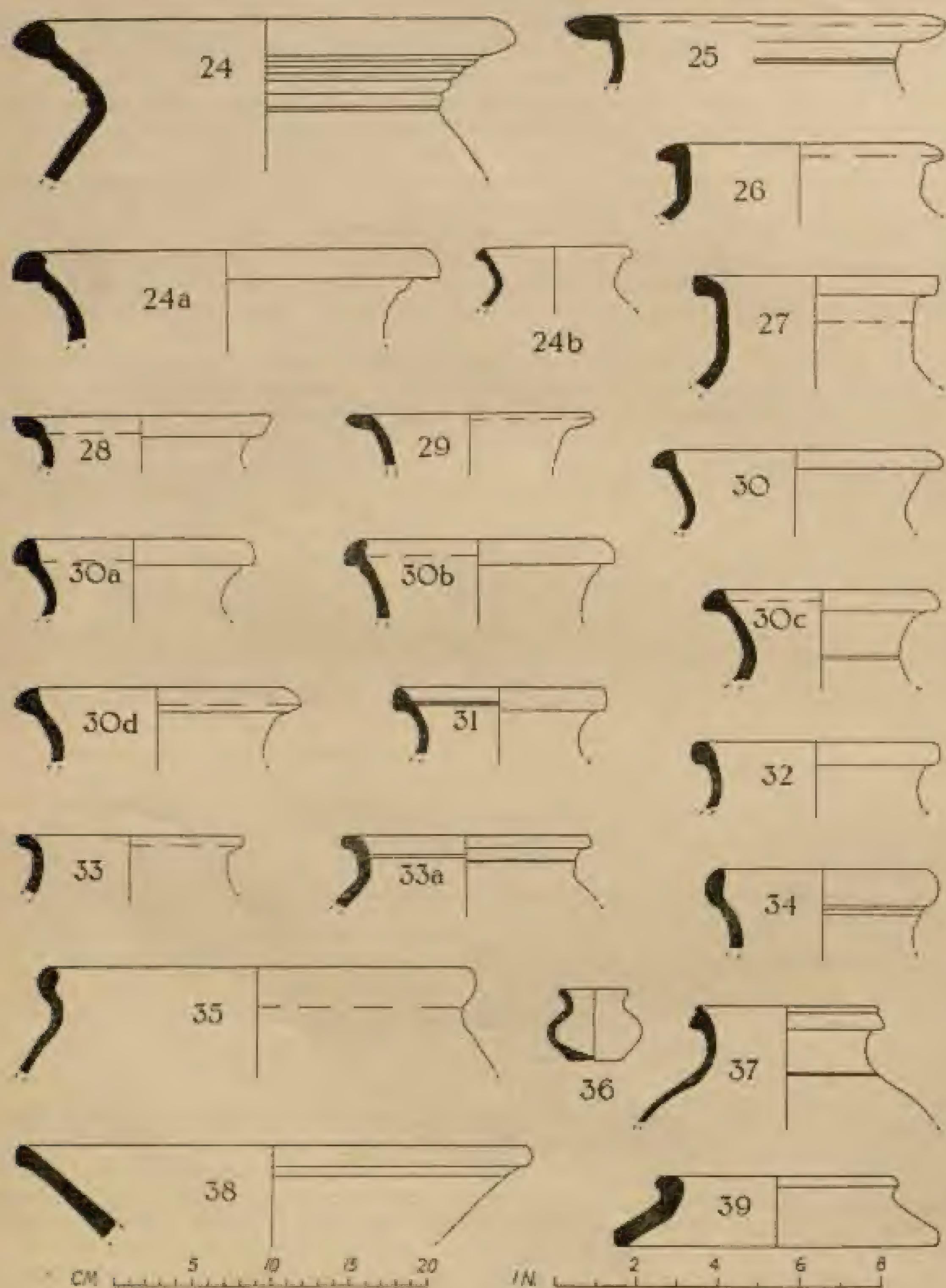


FIG. 25. *Pottery from Period II: other wares*

38. Rim-fragment of a vase or basin of red ware showing a splayed-out angle. The illustrated example is of medium fabric showing an unoxidized smoky core and spallings due to explosion of the inclusion and is treated with a red slip internally. From a mid-level of Period II.

39. Stand of dull-red ware with an out-curved rim and stable base. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From the overlapped levels of Periods II and III.

40. Pear-shaped vase of dull-red ware with a vertical rim, distinguished by a ridge on the outside. The illustrated example is of fine-to-medium fabric showing an oxidized core and is devoid of any surface-treatment. From an unstratified level of Period II. *Variant 40a*, of the same fabric as above, differs in having an externally-chamfered rim. From a mid-level of the Period.

41. Carinated *hāṇḍi* of red ware with a closing featureless rim. The illustrated example is of medium fabric showing an oxidized core and is treated with a red slip on the outside. The available part below the carination shows soot-marks indicative of its use as a cooking-vessel. From a mid-level of Period II.

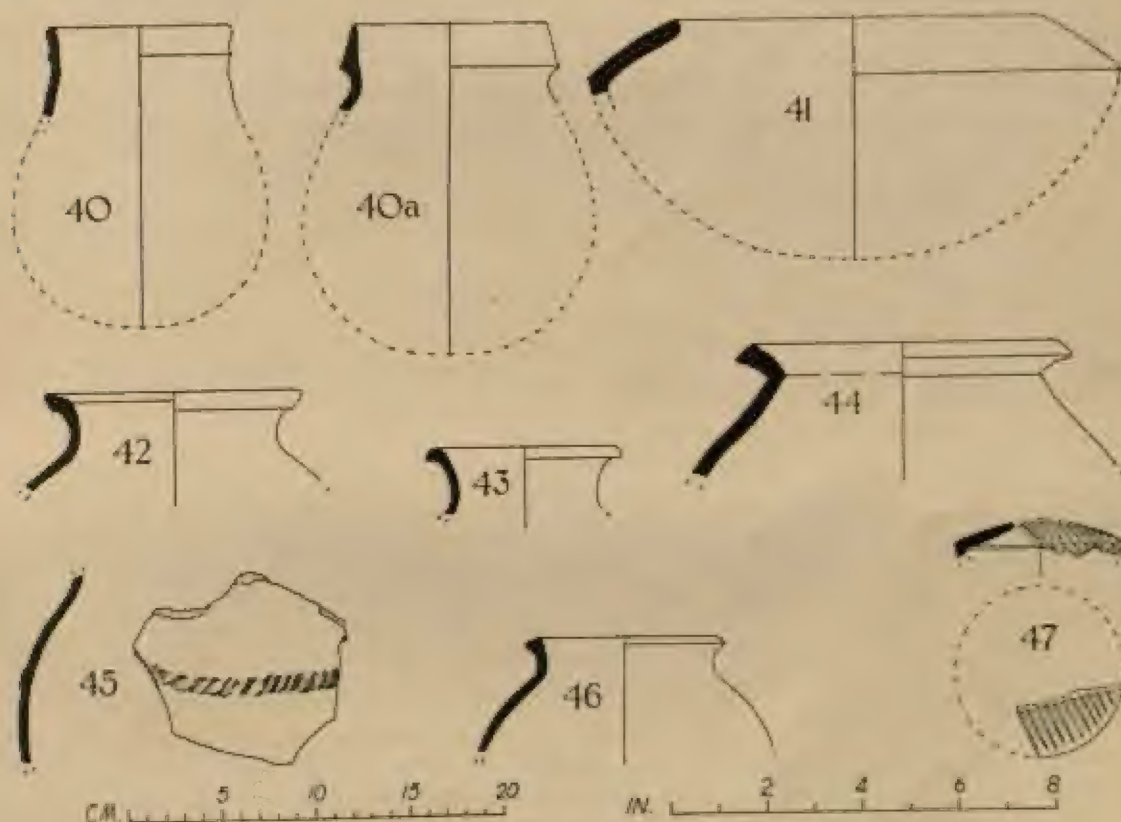


FIG. 26. *Pottery from Period II: other wares*

42. Vase of red ware with an out-turned externally square-collared rim, a concave neck and convex shoulders. The illustrated example is of medium fabric showing an unoxidized smoky core and vesiculated paste and is treated with a red slip on the outside and up to the neck on the inside. From a mid-level of Period II.

43. Vase of dull-grey ware with an out-curved rim. The illustrated example is of fine-to-medium fabric showing an incompletely-oxidized core and is wet-smoothed. From a late level of Period II.

44. Vase of red ware with a sharply out-turned thickened rim and oblique shoulders. The illustrated example is of medium fabric showing an oxidized brick-red core and is treated with a red slip on the outside and up to the neck-portion on the inside. From the overlapped levels of Periods II and III.

45. Fragment of a vase of red ware distinguished by an applied rope-design. The illustrated example is of medium fabric showing an oxidized core and is slipped in red on the outside. From an early level of Period II.

46. Vase of red ware with an almost vertical externally-thickened rim and a spheroid profile. The illustrated example is of medium fabric showing an unoxidized smoky core and is devoid of any surface-treatment. From a mid-level of Period II.

47. Lid, possibly of a casket, distinguished by a grooved top. The illustrated example is of fine fabric showing an oxidized core and is slipped in black on the outside. From an early level of Period II. Also pl. XXVI A, *6*.

D. Period III

The pottery of this Period is essentially uninspiring and is wholly of monochrome red ware, thrown on a wheel. A poor workmanship in potting-technique is clearly discernible. Of the clays used, there is little that need be said. The surface-colour ranges from dull-red to bright-red and results from the application of a self-slip or a thin red slip. The texture of the paste is, as a rule, dense with sparse-to-medium concentration of the inclusions which comprise finer minerals, only occasionally combined with vegetable-matter. The fracture is rough. The ware is fired at a medium temperature and often shows an unoxidized smoky core in the mid-section.

In shapes there is little evidence of inventiveness, the general repertory being marked by a monotonous conservatism with a few types adapted for specific uses. These include the widely-distributed lid (fig. 27, *1* and *2*), bowl with tapering sides (fig. 27, *3*), familiar basin, one of them with a pinched spout (fig. 27, *4* and *5*) and vase (fig. 27, *13*; fig. 28, *19* and *21*). Of the last type, the one with a splayed-out rim, affording an easy grip (fig. 28, *21*), seemed to be more common and perhaps also useful for domestic purposes. Traces of a spout are also available on one of the vases (fig. 27, *12*). The dish-form is conspicuous by its absence.

In association with this monotonous series were also found, from the mid-levels and upwards, a few sherds of the well-known Red Polished Ware in the characteristic sprinkler-form (fig. 28, *22*) and dated to the first four or five centuries of the Christian era.[1] This provides the sequence with some workable datum which is further reinforced by the occurrence of painted sherds (fig. 28, *20* and *26* to *28*), typical of the Kshatrapa period. Similarly, painted sherds were also found from the last three stages of Stratum III at Ahichchhatrā, ascribable to A.D. 350-750.[2]

Other decorations met with include an applied band of criss-cross lines (fig. 28, *24*) and an incised motif showing the hind part of an animal (fig. 28, *23*).

The following represent the select types.

Figs. 27 and 28

1. Lid of red ware with a vertical featureless rim, a horizontally-flanged waist and a rounded lower part. The illustrated specimen is of medium fabric showing an incompletely oxidized

[1] B. Subbarao, *Baroda Through the Ages* (Baroda, 1953), pp. 56-58 and fig. 24; also *op. cit.* (1958), pp. 46-47; also S. C. Ray, '*Stratigraphic evidence of coins in Indian excavations and some allied issues*', Numismatic Notes and Monographs, no. 8 (1959), pp. 14 and 15.

[2] A. Ghosh and K. C., Panigarhi, 'The pottery of Ahichchhatra, District Bareilly, U. P.', *Ancient India*, no. 1, p. 50 and fig. 8, *17*.

core and is treated with a thin-red slip. The underpart of the flange shows abrasions. From a mid-level of Period III. *Variant 1a*, of the same fabric, differs from the above in the angle of the rim and the inconspicuous nature of the flange. The illustrated example is from a mid-level of Period III. *Variant 1b*, of thinner and uniform section, differs from the main type in being shallower and having a concave flange. The illustrated example is of medium fabric showing an oxidized red core and is treated with a red slip, available on the outside of the rim and the flange. From an early level of Period III.

2. Lid of red ware with a central knob on the inner side. The illustrated example is of medium fabric showing an unoxidized smoky core in the mid-section and is devoid of any surface-treatment. From an early level of Period III.

3. Bowl of dull-red ware with a featureless rim and sides tapering to a flat string-cut base. The illustrated example is of medium fabric showing an oxidized core, indifferently fired, and is treated with a self-slip, particularly seen on the inside. From a mid-level of Period III. *Variant 3a*, of the same fabric as above, differs in having weakly-corrugated sides and a prominent string-cut disc-base. From a mid-level of Period III.

4. Basin of red ware with a vertical thinned rim marked by a cordon at the junction with the lower part. It is further distinguished by a pinched spout. The illustrated example is of medium fabric showing an oxidized core and is treated with a thin red slip. From an early level of Period III.

5. Basin of red ware with a vertical externally-grooved rim, a carinated profile and presumably deeper sides. The illustrated example is of thick medium fabric showing an unoxidized smoky core in the mid-section and is treated with a self-slip. From a mid-level of Period III.

6. Deep bowl of red ware with a clubbed rim and an inverted bell-shaped profile, marked by the grooves on the upper half. The illustrated example is of medium fabric showing an oxidized core and is treated with a red slip on the outside. From a mid-level of Period III.

7. Miniature vase of dull-red ware with an out-curved featureless rim, spherical sides and a flat string-cut base. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From an early level of Period III.

8. Shallow hand-made bowl of drab ware with a featureless rim and a convex base. The illustrated example is of coarse friable fabric showing an unoxidized smoky core with pores and is devoid of any surface-treatment. From the same level as above.

9. Vase of red ware with an out-curved featureless rim and ovoid profile. The illustrated example is of medium fabric showing an unoxidized core and is treated with a self-slip on the outside. From a mid-level of Period III.

10. Vase of red ware with an out-turned thickened rim and convex sides. The illustrated example is of medium fabric showing an unoxidized core and is indifferently fired. From an early level of Period III. *Variant 10a* differs from the above in having a pronouncedly-carinated neck and oblique shoulders. The illustrated example is of medium fabric showing an unoxidized core and is treated with a tan slip on the outside. From an early level of the Period.

11. Vase of red ware with a flared thickened rim and narrow neck. The illustrated example is of medium fabric showing an oxidized core and is treated with a red slip on the outside. From the same level as above.

12. Vase of red ware with an out-turned featureless rim and convex shoulders. It is further distinguished by a spout, only a portion of which is available in the present example. The illustrated example is of medium fabric showing an oxidized core and is devoid of any surface-treatment. From a late level of Period III.

13. Vase of red ware with an out-curved thickened and undercut rim. The illustrated example is of medium fabric showing an oxidized core and is wet-smoothed externally. From an unstratified level. *Variant 13a*, of the same fabric as above, differs in having a blunt beak of the rim. From an early level of Period III. *Variant 13b* differs from the main type in having a sharper beak and wider flaring angle. The illustrated example is of fine-to-medium fabric showing an unoxidized



FIG. 27. *Pottery from Period III*

smoky core and is treated with a bright-red slip on the outside. At most places, however, it has flaked off exposing the mat tan-coloured body. From a mid-level of Period III. *Variant 13c* differs from the above sub-type in having a recurved externally-grooved rim. The illustrated example is of medium fabric showing a red oxidized core and is treated with a red slip. From a mid-level of Period III. *Variant 13d*, of thin ware, is characterized by an externally elliptical-collared rim. The illustrated example is of fine fabric showing an unoxidized smoky core in the mid-section, and is treated with a red slip. From a mid-level of Period III.

14. Vase of red ware with a slightly-widening simple collared rim and oblique shoulders. The illustrated example is of medium fabric showing an unoxidized smoky core and is self-slipped and thereafter burnished. From an early level of Period III.

15. Vase of red ware with an out-turned obliquely-cut rim, a short vertical neck and convex shoulders. The illustrated example is of medium fabric showing an unoxidized core and is treated with a red slip on the outside. From an early level of Period III.

16. Vase of red ware with a splayed-out featureless rim, a carinated neck and a globular profile. The illustrated example is of medium fabric, has burnt red outside and black inside and shows black towards the inner part of the core. It is treated with a slip on the outside and up to the neck on the inside. From an early level of Period III.

17. Vase of red ware with an out-curved featureless rim showing a weak carination internally on the neck and short oblique faceted shoulders. The illustrated example is of medium fabric showing an unoxidized core and is self-slipped and thereafter burnished. From a mid-level of Period III.

18. Vase of drab ware with an out-curved featureless rim and slightly concave shoulders. The illustrated example is of medium fabric showing an incompletely oxidized core and is wet-smoothed on the outside. From an early level of Period III.

19. Vase of red ware with a vertical externally-thickened rim and a cylindrical neck, distinguished by grooves in the lower part. The illustrated example is of medium fabric showing an oxidized core and is treated with a red slip and thereafter polished or burnished. From an early level of Period III. *Variant 19a*, of dull red ware, differs from the above in having an undercut groove on the inner side of the rim. The illustrated example lacks any surface-treatment. From an early level of Period III. *Variant 19b* differs from the main type in the widening nature of the neck and the absence of grooves. The illustrated example, however, is decorated with a design consisting of panelled zigzags trailed in white. Of the same fabric as above. From a mid-level of Period III.

20. Vase of red ware with a flaring internally-thickened and ledged rim. It is painted on the outside with alternate bands of black and white over a red-slipped surface The illustrated example is of medium fabric showing an unoxidized smoky core and is treated with a red polished slip on the outside and up to the rim on the inside. From a mid-level of Period III.

21. Vase of red ware with a splayed-out externally-thickened and internally-beaked rim and oblique shoulders. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated with a red slip on the outside. From an unstratified level of Period III. *Variant 21a*, of the same fabric as above, differs in the absence of the beak and in having convex shoulders. The illustrated example is from an early level of Period III. *Variant 21b* differs in having oblique shoulders marked by grooves. The illustrated example is from an early level of Period III. *Variant 21c* is distinguished by grooves on the shoulder and on the inner side of the rim. The illustrated example is from an early level of Period III. *Variant 21d* differs from the main type in having a longer rim and a sharply-carinated neck. The illustrated example is of the same fabric and is, in addition, burnished on the outside. From a late level of Period III.

22. Upper part of a bottle-necked sprinkler with a flanged rim-top and a knobbed opening. The other component part, viz. the spout with a strainer back, is shown separately. Of fine fabric showing an oxidized core, it is treated with a red polished slip. The illustrated specimens are from two different mid-levels of Period III, the spout part in the characteristic fabric being earlier in occurrence.

The following series represent the decorated examples.

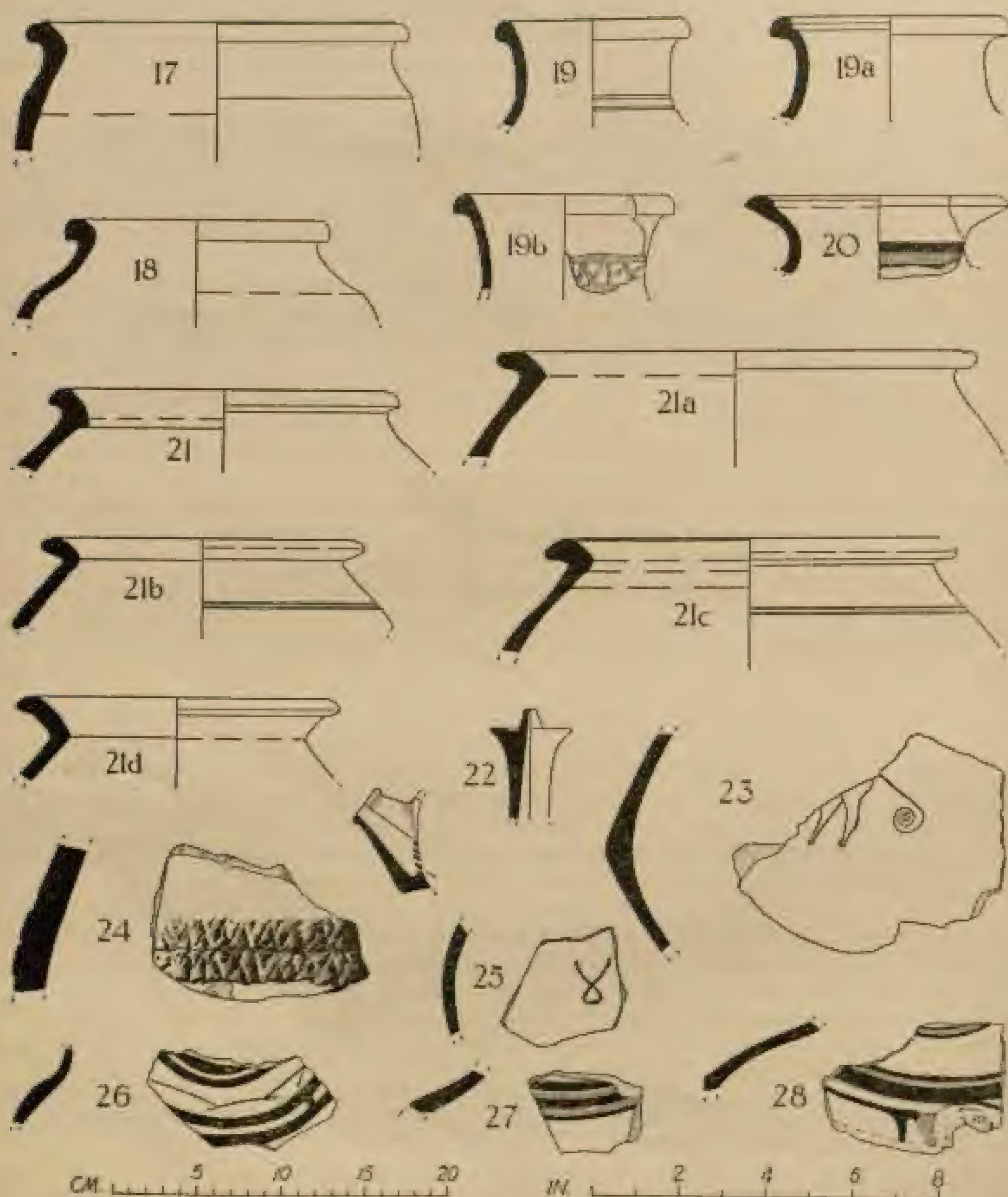


FIG. 28. *Pottery from Period III*

23. Mid-portion of a vase of red ware showing a carinated profile. Of medium fabric showing an oxidized red core, it is treated with a bright-red slip and is further distinguished by an incised motif showing the hind part of an animal. The design was executed before firing. From a mid-level of Period III.

24. Mid-portion of a vase of red ware showing at the girth an applied band of criss-cross pattern. Of thick medium fabric showing an oxidized red core, it is treated on the outside with a red slip. From an early level of Period III.

25. Mid-portion of a vase of red ware showing an incised design resembling Brāhmī letter *ma*. Of medium fabric showing oxidized core, it is treated with a slip. From an early level of Period III.

26. Shoulder-part of a vase of red ware showing horizontal bands in red. Of medium fabric showing an unoxidized smoky core, it is treated externally with a self-slip and thereafter painted. From a mid-level of Period III.

27. Shoulder-portion of a vase of red ware showing painted bands of alternate black and white (hatched). Of medium fabric showing an oxidized core, it is treated with a red slip. From a mid-level of Period III.

28. Shoulder portion of a vase of red ware showing painted bands of alternate black and white (hatched), the lower most showing an incomplete design. Of the same fabric as above. From a mid-level of Period III.

E. Period IV

The pottery of this Period is not worthy of any particular notice. With the common use of metals, pottery had to compete with vessels of base metals and thus lost sophistication and artistic merit. Perhaps for this reason, the potter's industry was neglected and was confined to the production of vessels primarily to serve the needs of the poor or for use in the kitchen. The pottery is marked by boorish elaborations like multigrooved shoulders and an impoverished rigid discipline in forms.

Two fabrics characterize the ceramics of this Period: (a) the red ware, and (b) the darkish-grey ware. The former is represented both in the unslipped and polished red-slipped variety, while the latter is mostly black or with greyish-black slip. A distinctive fabric in the dull-red ware is, however, of the cooking-vessels (fig. 29, *9*), the slip-content of which shows powdered mica resulting in a peculiar glistening appearance with the lustre varying from silvery to light-golden. The paste of both the fabrics is, as a rule, dense with medium concentration of the inclusions comprising minerals and vegetable-matter. The foreign bodies from the clay do not seem to have been removed. The wares give a rough fracture and are fired at a medium temperature, very often showing an unoxidized smoky core and porous body. The slip is mostly on the outside and is sometimes very bright and polished.

Standard shapes are very few and simple and comprise the bowl (fig. 29, *1* and *5*) and vase (fig. 30, *14*, *15* and *18*). Of these, the vase-forms are available both in the red and black-slipped fabrics.

A comparative study of these wares is not possible, as not much is recorded about the ordinary pottery of this Period from other sites.

The following select types are illustrated.

Figs. 29 and 30

1. Bowl of red ware with a featureless rim, tapering sides and a string-cut flat base. The illustrated specimen is of medium fabric showing an oxidized red core and is treated with a red slip on the inside. From a mid-level of Period IV. *Variant 1a* is distinguished by a thickened rim. The illustrated specimen is of medium fabric showing an unoxidized smoky core, and is devoid of any surface-treatment. From a late level of the Period.

2. Small-sized shallow vase of drab ware with an out-turned featureless rim, convex shoulder and cordoned profile. The illustrated specimen is of medium fabric showing an unoxidized smoky core and is treated with a red slip on the ouside. From a mid-level of Period IV.

3. Bowl of red ware with a vertical featureless rim, slightly-ledged shoulders and rounded sides. The illustrated specimen is of the same fabric as above and is treated both externally and internally with a red slip. From a late level of Period IV.

4. Plater of drab ware with tapering sides and a flat base, possibly a dough-plate. The illustrated specimen is of medium fabric showing an unoxidized smoky core and granular paste and is burnished on the inner side but not extending to the central area. From the same level as *1* above.

5. Bowl of red ware with an internally elliptical-collared rim and tapering sides. The illustrated specimen is of medium fabric showing an incompletely-oxidized core and is devoid of any surface-treatment. From the overlapped level of Periods III and IV.

6. Basin or *kaṛāhī* of dull-red ware with an out-turned slightly thickened rim and distinguished further by an applied lug. The illustrated specimen is of medium fabric showing an unoxidized smoky core and is treated both externally and internally with a self-slip. From an early level of Period IV.

7. Vase of dull-red ware with an out-turned featureless rim, convex sides and low girth. The illustrated specimen is of the same fabric as above but is devoid of any surface-treatment. From a late level of Period IV.

8. Vase of drab ware with an everted featureless rim, oblique shoulders marked by an inconspicuous ledge at the lower part and rounded base. The illustrated specimen is of medium fabric showing an unoxidized smoky core in the mid-section and is treated both externally and internally with a slip and burnished externally. From an early level of Period IV.

9. Vase of red ware with an out-turned featureless rim, marked internally by a ridge, corrugated oblique shoulders and sharply-carrinated profile. The illustrated specimen is of the same fabric as above and shows soot-marks on the underside, and as such served as a cooking-vessel. The type is very common and seems to be universally used. The illustrated example is from the latest level of Period IV. *Variant 9a*, of drab ware, differs from the above in having multigrooved shoulders, ledged at the junction with the body, in being deeper and of thinner section. It is distinguished further by seven punched circles on the shoulders. The illustrated example is of medium fabric showing an incompletely-oxidized core devoid of any surface-dressing and bears soot-marks on the underside. From a mid-level of Period IV. *Variant 9b* differs from the above in having a pronounced ledge at the shoulder. The illustrated example is slipped with a mica-solution externally up to the shoulders. From a mid-level of Period IV. *Variant 9c*, of the same fabric as above, lacks the grooves on the shoulders and has a thinner section. The illustrated example is from a late level of Period IV. *Variant 9d* differs from *9a* in being bigger in size and having a groove on the internal side of the rim. The illustrated example is from a late level of Period IV. *Variant 9e* differs from the above in having a lesser angle of the rim and weak corrugations on the shoulders. The illustrated example is from a late level of Period IV. *Variant 9f*, of the same fabric as above, differs in the position of the ledge and the profile. The mica-slip and soot-marks are, however, more prominent in the illustrated example, which is from an overlapped level of Periods III and IV. *Variant 9g*, of the same fabric as above, differs in the splaying of the rim and in having a cylindrical profile. The illustrated example is from a mid-level of Period IV.

10. Miniature vase of red ware with a slightly out-turned rim and globular profile. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated with a self-slip. From a mid-level of Period IV.

11. Miniature vase of drab ware with a vertical featureless rim and globular profile. The illustrated example is of medium fabric showing an oxidized core and is treated with a self-slip. From a late level of Period IV.

12. Vase of red ware with a vertical externally-flanged rim and concave shoulders. The illustrated example is of medium fabric showing an unoxidized smoky core and is treated wth a red slip. From an early level of Period IV. *Variant 12a*, of the same fabric as above, differs in having

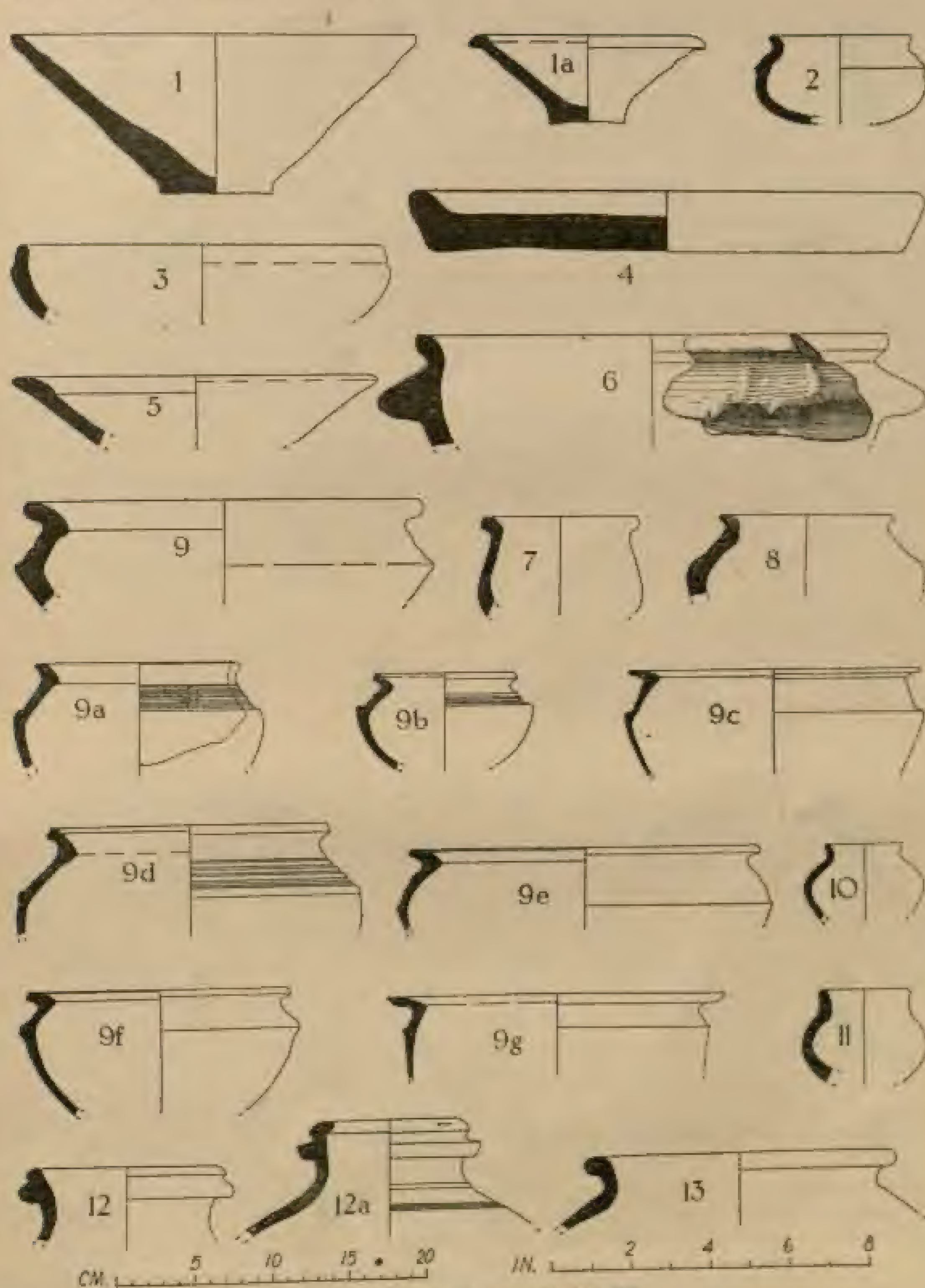


FIG. 29. *Pottery from Period IV*

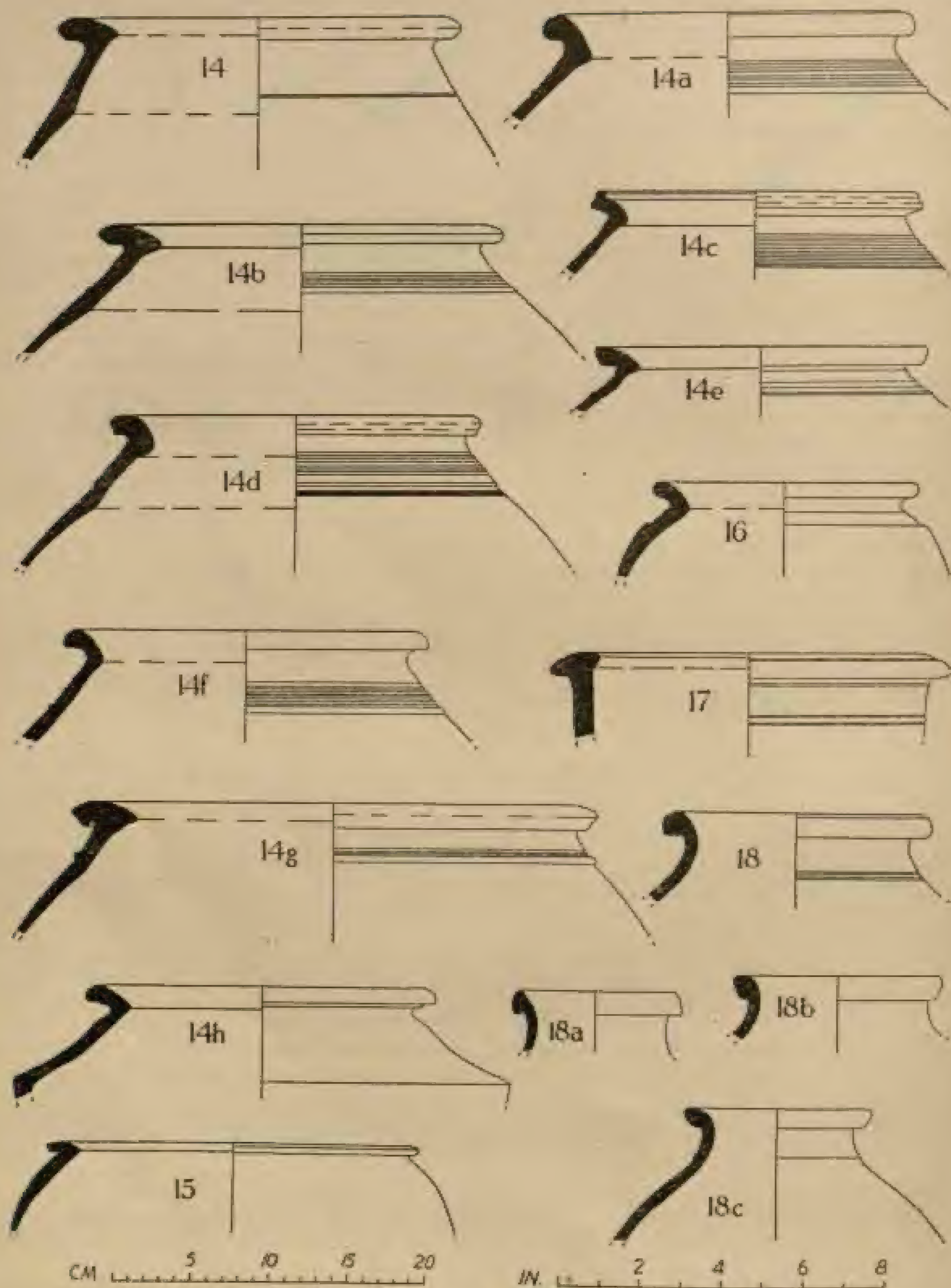


FIG. 30. *Pottery from Period IV*

an internally-thickened rim and grooved shoulders. The illustrated example is from a mid-level of Period IV.

13. Vase of black ware with a vertical externally-beaded rim, short neck and oblique shoulders. The illustrated example is of medium fabric showing an unoxidized smoky core and is treated on the outside with a black slip. From an early level of Period IV.

14. Vase of red ware with an out-turned thickened or clubbed rim perched on oblique shoulders which are further distinguished by grooves. The illustrated example is of medium fabric showing an unoxidized margin towards the inner surface and is treated on the outside with a chocolate slip. From a late level of Period IV. *Variant 14a,* of the same fabric as above, differs in having a different angle of the rim. The illustrated example is from a late level of Period IV. *Variant 14b* is of black slipped ware with multi-grooved shoulders. The illustrated example is from a mid-level of Period IV. *Variant 14c* is distinguished by a groove on the inner side of the rim. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated with a red slip. From a late level of Period IV. *Variant 14d* differs in having a short out-curved externally-grooved rim. The illustrated example is of the same fabric as above and is from a mid-level of Period IV. *Variant 14e* shows a more splaying of the rim, marked by a ridge on the inner side. The illustrated example is of the same fabric as above and also comes from the same level as above. *Variant 14f* is distinguished by an out-curved thickened rim. The illustrated example is of the same fabric as above and comes from a mid-level of Period IV. *Variant 14g* differs from the main type in the folding tendency of the rim and is further characterized by a cordon on the shoulder. The illustrated example is of the same fabric as above and comes from a late level of Period IV. *Variant 14h* is characterized by an out-turned externally-thickened rim and ledged oblique shoulders. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated externally with a black slip. From an early level of Period IV.

15. Vase of black ware with an out-turned featureless rim perched on convex shoulders. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated externally with a black slip. From an early level of Period IV. Examples with red slip are also available.

16. Vase of black ware with an out-curved featureless rim and high ledged shoulder. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated externally with a black slip. The illustrated example is from a mid-level of Period IV.

17. Basin of darkish-grey ware with a nail-head rim and almost straight sides distinguished by grooves on the outside. The illustrated example is of medium fabric showing incompletely-oxidized core and is devoid of any surface-treatment. From a mid-level of Period IV.

18. Vase of red ware with an out-curved undercut rim and concave shoulders characterized by grooves. The illustrated example is of medium fabric showing an incompletely-oxidized core and is treated externally with a tan slip. From the latest level of Period IV. *Variant 18a* has an elliptical-collared and undercut rim. The illustrated example is treated with a bright-red slip on the outside. From a late level of Period IV. *Variant 18b* is distinguished by a faceted-collared rim. The illustrated example is of the same fabric as the main type and is from a late level of Period IV. *Variant 18c* is characterized by a round-collared rim, a weak cordon on the lower part of the neck and convex shoulders. The illustrated example is of medium fabric showing an unoxidized smoky core in the mid-section and is treated externally with a bright-red slip. From a mid level of Period IV.

7. OTHER FINDS

A. Blades and microliths

The industry of blades and microliths, particularly characteristic of the post-Indus chalcolithic cultures of central India and the Deccan, has often been, though not discriminately, described under the widely-current term 'microlithic'. The term in its

present application covers all classes of small or minute implements of stone, irrespective of associated assemblage, and is misleading especially for the understanding of the specialized true microlithic industries of the earlier series which are not associated with pottery. The comprehensive terms 'Blade Industry', 'Chalcolithic Blade Industry', 'Short (Micro) Blade Industry' and 'Neolithic Blade Industry',[1] adopted essentially to justify the predominance of the blade type or perhaps to emphasize the technique or cultural kinship between these blades and those of the normal Indus type is equally inappropriate as it tends to exclude the recurrent, if less obvious, microlithic component of the industry as represented by such ubiquitous types as points, lunates, trapezes, etc. A matter-of-fact designation as 'flaked or chipped stone objects'[2] would be an catch-all appellation being an overgeneralization of an industry with defined traits. The term 'microlith' is too well-established through persistent usage, and for a distinction this industry has also been described as 'regulation' microlithic industry.[3] A utility term 'blade and microlithic industry', though a clumsy compromise, seems to be more precise at this stage.

With a view to determining the exact character of the intriguing microlithic element, quantitative analysis of the various types including length- and breadth-measurements are shown in histograms (figs. 31 and 32), and it is hoped that they will provide a workable corpus of data for future studies requiring sharper discrimination of the microlithic industries of India and a basis for discussion and appraisal. The vital need, however, is to investigate whether there was any continuum or diffusional stimulus of microlithic tradition from the non-geometric through geometric series into the chalcolithic culture complex.

The excavation yielded six hundred tools of this industry, besides twentyfour flakes with crested ridge showing alternate flaking and twentyone cores. Of the total number of artefacts, thirtythree, including two crested-ridged flakes, came from the unstratified and the upper levels as stray finds. The remaining examples are all from Period I. The raw material employed for their manufacture comprised: chalcedony, being the normal medium; agate; carnelian; rock-crystal; quartz; and jasper. All these are readily available in the inter-trappean beds and from the nodules abundantly found in the river-beds.

Attention has already been drawn to the loose and indifferent terminology of the microlithic industries and the long-felt need for standardization or rationalization based on the functions of the tools.[4] It would suffice to reiterate here that such a basis would provide a broader humanistic approach in terms of ecology and enable us to understand the basic economy and food-habits of the people who used these tools.

The tools from Prakash are classified in the following types on the basis of their hypothetical methods of normal employment. Admittedly, this does not preclude the possibility of one type being used for more than one purpose. For example, it is arguable

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[1] Sankalia, Subbarao and Deo, *op. cit.* (1958), pp. 41-65; Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), pp. 114-49; H. D. Sankalia, *Indian Archaeology To-day* (Bombay, 1962), p. 82; and Allchin, *op. cit.*, pp. 95-106.

[2] R. J. Braidwood and Linda S. Braidwood, *Excavation in the Plain of Antioch*, Oriental Institute Publications, LXI (Chicago, 1960), and R. J. Braidwood and Bruce Howe, *Prehistoric Investigations in Iraqi Kurdistan*, Studies in Ancient Oriental Civilization, no. 31 (Chicago, 1960), pp. 44-45; Perry A Bailor, 'The chipped stone industry of Catal Hüyük', *Anatolian Studies*, XII (1962), pp. 67-110.

[3] Wheeler, *op. cit.* (1959), p. 145.

[4] Thapar, *op. cit.*, p. 89; B. B. Lal, 'Birbhanpur: a microlithic site in the Damodar valley, West Bengal', *Ancient India*, no. 14 (New Delhi, 1958), p. 19.

that some of the pen-knife blades (type IV) could have also served as points, but from the use-marks, normally seen along the margin opposite the blunted side, they seem to be intended for cutting and have, therefore, been classified as blades. Similarly, the blunted-black blades showing fine retouchings on the distal end (type III B) are likewise, on the evidence of use-marks, essentially cutting-blades rather than end-scrapers. A rigid classificatory discipline on purely typological basis is difficult to maintain.

Type I (four hundred and thirteen examples): parallel-sided flakes, alternatively called blades, well-controlled narrow flakes with both edges retaining the primary flake-cut and utilized as struck, without any retouching. The edges produced were probably equal or superior to the edges obtained by tedious retouching. They are essentially flat and show a broadly-bevelled trapezoidal or triangular section. The bulbs of percussion are normally present but are subdued and soft. The distal end in some cases seems to have been snapped off. They range from 17 to 40 mm. in length and from 4 to 10 mm. in width, with 22·30 and 5·5 to 7 mm. respectively as the normal spread. The length-breadth index varies from 14·2 to 40·9, with over 65 per cent concentrated between 18 and 28 and 50 per cent between 20 and 26.

Type II (twentythree examples): serrated blades—parallel-sided with one of the marginal sides trimmed to produce a saw-like edge, while the other either retains the primary flake-cut as struck, or is purposely blunted by steep retouchings to strengthen the edge and to facilitate hafting, the latter variety accounting for nearly 60 per cent. The serrations are mostly close-set although examples with well-spaced dentations are also available. The bulbar end is missing on most of the examples. They range from 18 to 32 mm. in length and from 3·5 to 11 (a lone example) in width, with 22 to 30 and 5·5 to 7 mm. respectively as the normal spread. The length-breadth index varies from 16·6 to 35·4 with over 65 per cent concentrated between 21 and 29 and 50 per cent between 23 and 29.

Type III (fiftyeight examples): blunted-black blades. Type III A (thirtyfive examples) is parallel-sided with one of the marginal sides purposely blunted by retouchings, steeply inclined to the main plane, while the other is razor-like sharp and shows use-marks. Type III B (twentythree examples) has in addition minute retouchings on the distal end. The unretouched marginal side shows use-marks indicative of their primary use as cutting-blades. The bulbar end is available only on three examples; on the remaining it has been removed. The implements range from 17·5 to 35·7 mm. in length and from 4 to 8 mm. (a lone example) in width, with 22 to 30 and 5·5 to 7 mm. respectively as the normal spread. The length-breadth index varies from 15·4 to 37·5 with over 65 per cent concentrated between 20 and 29·5 and 50 per cent between 23 and 29·5.

Type IV (thirtythree examples): pen-knife blades. They show use-marks on the unretouched sides opposite the blunted margin. Some of the tools, however, may have served as blade-*cum*-points. Type IV A (ten examples) shows the blunted-back forming a curved outline. In some instances the blunting is confined to the upper half or two-thirds part of the side. Type IV B (twentythree examples) shows one of the straight sides obliquely truncated towards the distal end. The truncated part of the margin shows retouchings, possibly to save the user's fingers from being cut and to provide a firmer grip. The implements range from 18 to 35 mm. in length and from 3·84 to 8 mm. (a lone example) in width, with 26 to 30 and 5·5 to 7 mm. respectively as the normal spread. The length-breadth index varies from 17·1 to 33·3 with nearly 65 per cent concentrated between 21 and 29·7 and 50 per cent between 22 and 27.

Type V (thirtytwo examples): points. Type V A (fifteen examples) is essentially a chip-point, tapering in width from the butt to the point. Occasionally, the implements

show some retouchings. The bulbar end is present in most of the examples. Type V B (two examples) shows a tang on the bulbar side resulting in a marked shoulder. Type V C (eleven examples) has both the sides worked either to a spike-like point, notably at the upper end after a superficial shoulder, or retouched to a point by regular trimming of one side and only point-trimming of the other. The bulbar end in most cases seems to have been snapped off. Type V D (four examples) shows straight and clean razor-like untrimmed edge on one side and a crescentically-formed blunted back on the other, the tip, which is pointed, being worked often from both sides. They range from 15 to 38 mm. in length and from 4 to 10·5 mm. (a lone example) in width, with 16 to 22 and 5 to 7 mm. respectively as the normal spread. The length-breadth index varies from 17·3 to 43·7 with over 65 per cent concentrated between 20 and 35 and 50 per cent between 20 and 28.

Type VI (twentythree examples): lunates. The implements show steep blunting on the arc-side opposite the straight sharp chord-edge. The arc-side is fairly symmetrical. In a couple of examples where the arc-side is ridged, both the dorsal and the ventral surfaces show a single-flake plane with a wedge-shaped section. They range from 14 to 26·5 mm. (a lone example) in length and from 4 to 8·8 mm. (again a lone example) in width, with 16 to 20 and 4·5 to 5·5 mm. respectively as the normal spread. The length-breadth index varies from 25·9 to 37·8, with over 65 per cent concentrated between 25 and 31·5 and 50 per cent between 25 and 30.

Type VII (eight examples): trapezes. The implements show retouchings on the truncated transverse sides, the lateral margins retaining the primary flake-cut. They range from 13·5 to 22 mm. in length and from 3·5 to 6·5 mm. in width, with 16 to 20 and 4·5 to 5·5 mm. respectively as the normal spread. The length-breadth index varies from 17·9 to 37 with over 50 per cent concentrated between 25 and 29.

Type VIII (ten examples): irregular utilized flakes. These flakes which have irregular and accidential shapes are part of the industrial waste or *débitage* material resulting from the non-precision of human working or the vagaries of the raw material. Their use as tools is attested by the use-marks and occasional retouchings on the edges.

Type IX (twentyfour examples): flakes with crested ridge showing alternate flaking at right angles to the major axis. As they present a distinctive stage in the production of narrow parallel-sided flakes, their presence indicates that the tool-preparation must have been practised on the occupation-site itself.

Type X (twentyone examples): cores. All of these show prepared striking-platform and parallel flake-scars, illustrative of the technique of special dressing to produce parallel-sided flakes. In most of the cases the cortex of the nodule is also present. Only four examples of cores worked on all the sides were found. By frequent removal of flakes they had become conical and thin. That the nodules were often fully utilized is suggested by the presence of implements showing nodular cortex. The longest available core in the present collection measures 42 mm.

The appended histograms (figs. 31 and 32) and the frequency-distribution (Table III, p. 100A) showing the quantitative analysis of the various tool-types merit some noteworthy comments. The parallel-sided flakes or plain blades form an overwhelming majority, being 69·06 per cent[1] of the total number of finished tools (types I-VIII). Thus, the proportion of implements exhibiting secondary working to primary flakes and blades, many of which show traces of use, is very small. Of the tools showing secondary

[1] In arriving at the percentages, implements from the unstratified and upper levels have not been taken into consideration.

working (types II-VII), the blades—serrated, blunted-back and pen-knife (types II-IV)—constitute 63·47 per cent, being numerically second in the aggregate. Points account for 18·56 per cent, lunates 13·17 per cent, and trapezes, 4·79 per cent.

The secondary working consists primarily of steep blunting retouch, sometimes extending to the marginal bevel surface. The excellent workmanship and excessive standardization of the implements suggest that most of the knapping was done by specialized workers.

Intriguing, however, is the problem of function. While the use of parallel-sided flakes and blades (types I-IV), except perhaps the dual-purpose pen-knife, for cutting-purposes as knives or kitchen-tool is indisputable, the method of employment of lunates, trapezes and points is still problematic. The latter group could make a composite tool with the point as the tip and the lunates or trapezes as barbs of spears or arrowheads, etc.[1] This naturally bears on the question of hunting perhaps for the supply of flesh. Alternatively, the trapezes and lunates could have been used as sickles, a purpose consistent with the requirements of crop-raising. The technique of flaking for all these types was, however, the same.

The industry shows relatively little change throughout the Period, except that tools showing secondary working are somewhat more limited in the upper levels (from layer 48 upwards), numbering only fiftythree as against one hundred and fourteen in the lower levels. But in view of the varying thickness of the corresponding strata, this differential distribution may not be overemphasized.

The histograms for the layerwise frequency-distribution are based on the data available in Table III.

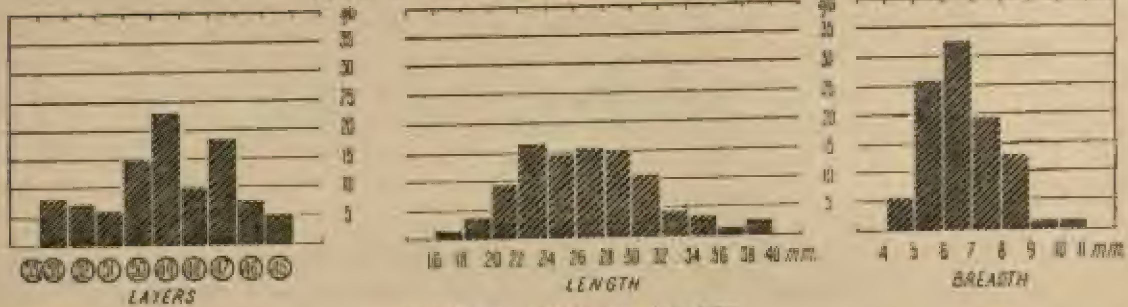
This actuarial analysis[2] suffers from the apparent defect of assuming a uniform class for each layer irrespective of the thickness and composition of the deposit. This is perhaps unavoidable in such varying archaeological phenomena where a constant rate of accumulation in time cannot be computed.

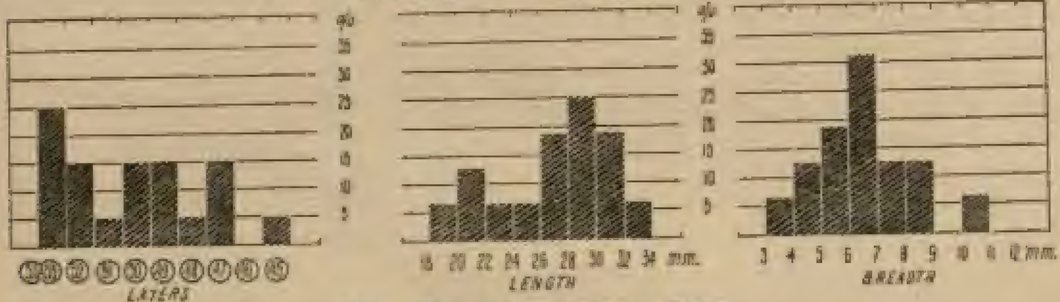
For the histograms of lengths and breadths, only complete specimens have been taken into consideration. The measurements are grouped into classes and the frequencies plotted against the class mid-points. Class-intervals have been so chosen as to give a minimum of five classes; for each tool-type a range of 2 mm. for lengths and 1 mm. for breadths has been adopted for the sake of uniformity. The number of examples, except for type I, is admittedly small for a statistical inference. Standard deviation and expected frequency have not, therefore, been computed. For the same reason histograms for each sub-type were found inexpedient. In these circumstances, while we cannot obviously claim precision, some broad indications are available to serve as basic data.

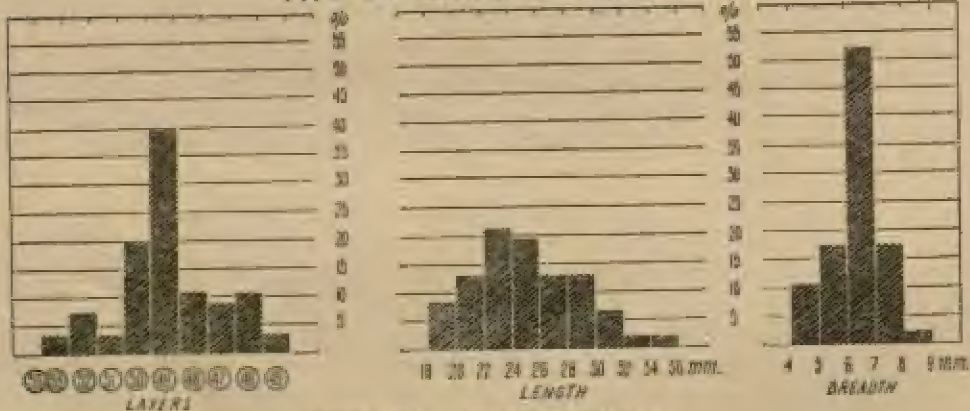
The histograms of breadths for types I-IV (fig. 31) show a systematic pattern of single-peaked type. From the standpoint of cultural patterning, therefore, 6 to 7 mm. would seem to be a standard optimum breadth. The histograms for lengths are asymmetrical and show more than one mode, the higher one in each case falling within classes 22 and 30 mm. The various modes give a wider range for optimum length. The observed difference in length may perhaps be conditioned, though not exclusively, by the size of the cores or by the non-precision in stone chipping.

[1] Cf. Bridget Allchin, ' The Late Stone Age of Ceylon ', *Jour. Roy. Anthropological Inst.*, 88, pt. II, (1958), pp. 199-200.

[2] I am thankful to Shri K. S. Ramachandran, Senior Technical Assistant, for assisting me in this analysis.







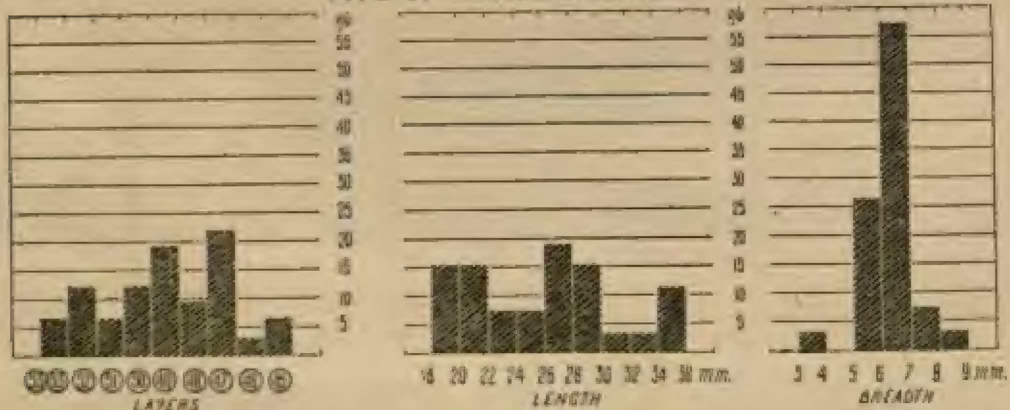


FIG. 31. *Histograms of types I-IV*

The histogram of breadth for type V (fig. 32) is bi- or tri-modal, with a range between 4 and 7 mm. The optimum, however, is between 5 and 7 mm. Similarly, the histogram of length is essentially bimodal, with each mode respectively at classes 16-18 and 20-22 mm. This phenomena may perhaps be due to the fact that the histograms are combined for the four sub-types which may have more than one attribute. The two tanged-blades of sub-type V B measure respectively 16 and 16·5 mm. in length and 6 and 7 mm. in breadth. Similarly, the three complete crescentic points of sub-type V D measure 19·5, 20·5 and 20·5 mm. in length and respectively 5·5 and 4·5 mm. in breadth. The range of measurements is only in the remaining two sub-types, of which sub-type V A is not standardized.

For types VI and VII, the histograms of breadth (fig. 32) show a workable mode between 4 and 7 mm., though the optimum would be between 5 and 6 mm. For the length,

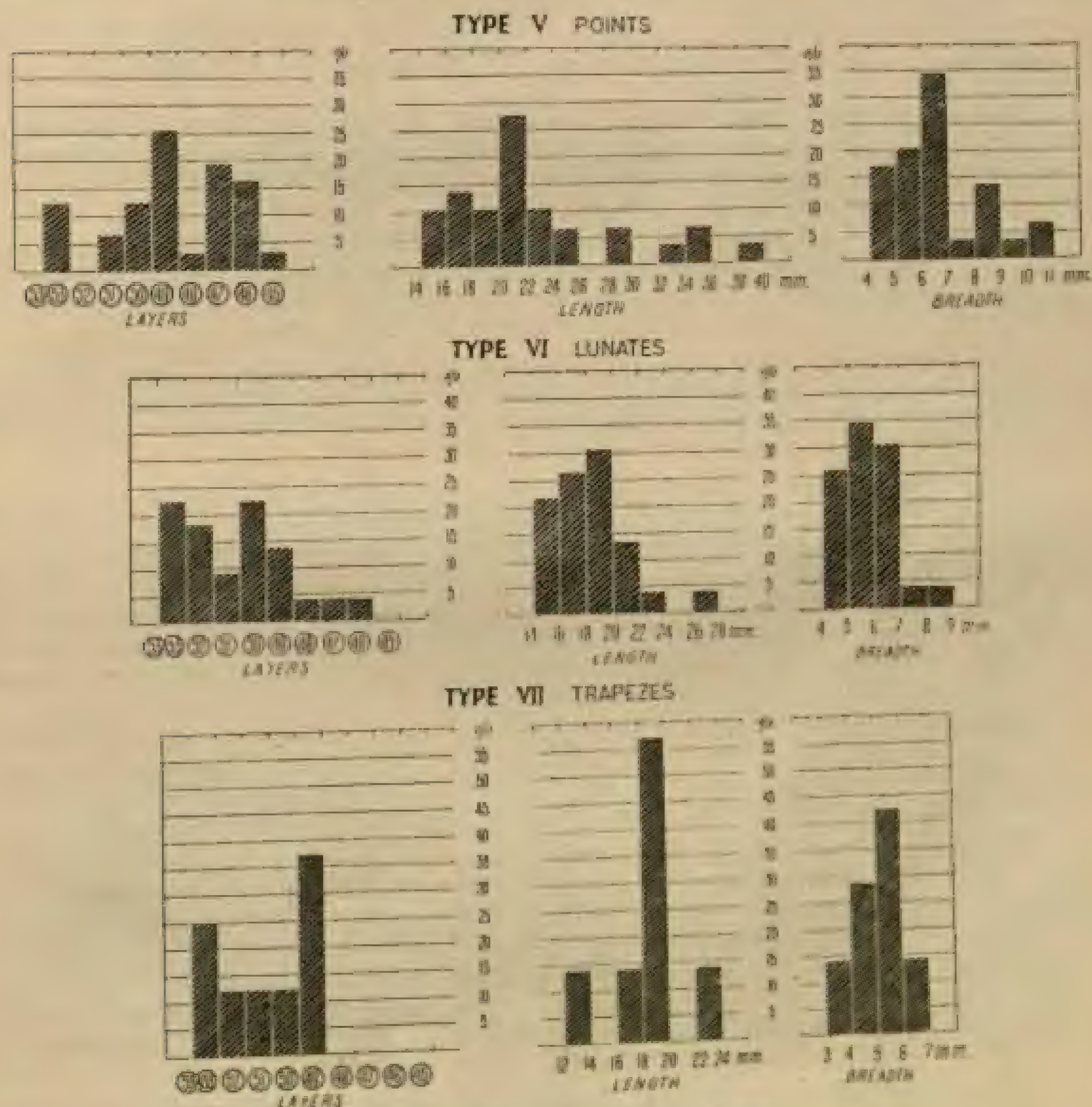


Fig. 32. *Histograms of types V-VII*

the optimum lies between 16 and 20 mm. Only seven complete examples of type VII were available. As such, the histograms for this type are not a good index for any reliable inference. It would be seen that the optimum length and breadth of the lunates and trapezes are shorter as compared with those of types I to IV. This is also indicated by the respective ranges of length-breadth indices.

The above observations, while quite encouraging and suggestive of further questions, are as yet an insufficient test for the functional classification of the tools which requires further investigation *inter alia* by the application of quantitative methods. To facilitate comparison between the results of individual research, it is desirable that a standard terminology and basic descriptive statistical methods be agreed upon among the workers in the field.

The selected specimens are listed below.

Figs. 33 and 34; pls. XVIII and XIX

1. Parallel-sided flake, blade, type I; rock-crystal. Working-edge shows chippings due to use. Bladish-flake of a broad-based triangular section with both the lateral margins retaining the primary flake-cut. The butt-end shows flake-scar and part of the bulb of percussion, the remaining part having been knapped off. From a mid-level of Period I. (PRK-1, 422.)

2. Parallel-sided flake, blade, type I; chalcedony, wax-coloured. One of the lateral margins shows use-marks. Bladish-flake with both margins retaining the primary flake-cut and having a section varying from triangular in the lower part to trapezoidal in the upper. The butt-end shows a diffused bulb of percussion. From a mid-level of Period I. (PRK-1, 560.)

3. Parallel-sided flake, blade, type I; chalcedony, light-brown in colour. One of the lateral margins shows use-marks. Bladish-flake of a trapezoidal section with both margins retaining the primary flake-cut. The butt-end shows a subdued bulb of percussion. The distal end is seen curled inwards and is thick. From an early level of Period I. (PRK-1, 573.)

4. Serrated blade, type II; quartz, translucent. Bladish-flake of a triangular section. The serrated edge shows some batterings due to use. While one of the lateral sides is serrated with well-spaced dentations, the other is blunted by steep retouchings. The butt-end shows only a soft swelling, the bulb-part being missing. From a mid-level of Period I. (PRK-1, 560.)

5. Serrated blade, type II; rock-crystal. The working-edge of the tool shows some use-marks. Bladish-flake of a trapezoidal transverse section with one of the lateral sides serrated with closely-set teeth and the other showing fine retouchings. The bulb of percussion is not present. From the earliest level of Period I. (PRK-1, 478.)

6. Serrated blade, type II; jasper, red variegated. The working-edge shows use-marks. Bladish-flake of a triangular transverse section. While one of the lateral sides is serrated with closely-set teeth, the other is blunted by steep retouchings. The bulb of percussion is not present; however, the butt-end shows slight swelling and part of a flake-scar. From the earliest level of Period I. (PRK-1, 580.)

7. Blunted-back blade, sub-type III A; chalcedony, wax-coloured. The working-edge shows batterings due to use. Bladish-flake with a triangular transverse section. One of the lateral sides is blunted by steep retouchings, while the other is sharp and shows primary flake-cut. The bulb-portion is only partly present. From the earliest level of Period I. (PRK-1, 493.)

8. Blunted-back blade, sub-type III A; chalcedony, light-yellow in colour. The working-edge shows use-marks. Bladish-flake of a triangular transverse section retaining the bulb of percussion which is soft. One of the lateral sides shows steep blunting, while the other is untouched, though chipped due to use. From a mid-level of Period I. (PRK-1, 438.)

9. Blunted-back blade, sub-type III B; chalcedony, translucent white. The working-edge shows chippings due to use. Bladish-flake of a triangular transverse section retaining the bulb of

TABLE III

FREQUENCY-DISTRIBUTION OF BLADES, MICROLITHS AND CORES

	Types / Layers	I Parallel sided flakes, blades	II Serrated blades	III Blunted-back blades		IV Pen-knife blades		V Points				VI Lunates	VII Trapezes	VIII Irregular	IX Crested ridged flakes	X Cores
				A Marginal side	B Marginal side with distal end	A Curved back	B Obliquely-truncated	A Plain	B Tanged	C Bimarginally worked	D Crescentic					
	53A	4 *57·14*	1 *14·28*	1 *14·28*	—	—	—	1 *14·28*	—	—	—	—	—	—	—	—
	53	30 *62·50*	4 *8·33*	1 *2·08*	—	—	2 *4·16*	2 *4·16*	—	1 *2·08*	—	5 *10·41*	2 *4·16*	1 *2·08*	1	3
	52	29 *64·44*	3 *6·66*	2 *4·44*	2 *4·44*	—	4 *8·88*	—	—	—	—	4 *8·88*	1 *2·22*	—	—	2
	51	24 *68·52*	1 *2·85*	2 *5·71*	—	—	2 *5·71*	1 *2·85*	—	1 *2·85*	—	2 *5·71*	1 *2·85*	1 *2·85*	2	2
	50	59 *66·29*	3 *3·37*	7 *7·86*	4 *4·49*	2 *2·24*	2 *2·24*	1 *1·12*	—	3 *3·37*	—	5 *5·61*	1 *1·12*	2 *2·24*	1	3
Period I	49	92 *68·65*	3 *2·23*	7 *5·18*	10 *7·50*	—	6 *4·47*	5 *3·75*	1 *·75*	2 *1·49*	—	3 *2·23*	3 *2·23*	2 *1·49*	3	4
	48	39 *76·47*	1 *1·96*	3 *5·88*	3 *5·88*	2 *3·92*	1 *1·96*	—	—	—	1 *1·96*	1 *1·96*	—	—	2	2
	47	65 *73·03*	3 *3·37*	2 *2·24*	3 *3·36*	2 *2·24*	5 *5·62*	2 *2·24*	1 *1·12*	2 *2·24*	1 *1·12*	1 *1·12*	—	2 *2·24*	7	3
	46	31 *68·88*	—	5 *11·11*	1 *2·22*	1 *2·22*	—	3 *6·67*	—	—	2 *4·44*	1 *2·22*	—	1 *2·22*	3	1
	45	20 *76·92*	1 *3·84*	2 *7·69*	—	2 *7·69*	—	—	—	1 *3·84*	—	—	—	—	3	1
	Total	393 *69·06*	20 *3·51*	32 *5·62*	23 *4·04*	9 *1·58*	22 *3·86*	15 *2·63*	2 *·34*	10 *1·75*	4 *·70*	22 *3·86*	8 *1·40*	9 *1·58*	22	21
	Unstratified	17	2	1	—	—	1	—	—	1	—	1	—	—	1	—
	Upper levels Periods II-IV	3	1	2	—	1	—	—	—	—	—	—	—	1	1	—
	Grand Total	413	23	35	23	10	23	15	2	11	4	23	8	10	24	21

The percentages, shown in italics, have been worked out only for tools of types I to VIII.

percussion with a flake-scar and a part of the striking-platform which is at right angles to the primary flake-surface. The right lateral margin as also the distal end are blunted by steep retouchings, the left side showing primary flake-cut. From a mid-level of Period I. (PRK-1, 555.)

10. Pen-knife blade, sub-type IV A; quartz, translucent. The marginal working-edge shows use-marks especially towards the upper half. Bladish-flake of a triangular to trapezoidal transverse section with the bulbar end snapped off. The left side is blunted in a curved outline, while the right one retains the primary flake-cut. From a late level of Period I. (PRK-1, 521.)

11. Pen-knife blade, sub-type IV A; quartz translucent. Same as above except that the transverse section is throughout triangular. From the latest level of Period I. (PRK-1, 541.)

12. Pen-knife blade, sub-type IV A; quartz, milky. Same as above except for the blunting which is on the right side and the presence of the bulb of percussion and a striking-platform on the butt-end. From a mid-level of Period I. (PRK-1, 411.)

13. Pen-knife blade, sub-type IV B; rock-crystal. Bladish-flake of a triangular transverse section retaining the bulb of percussion and a part of the striking-platform which is at right angles to the flake-surface. While the left side throughout retains the primary flake-cut, the right is obliquely truncated towards the upper end. The truncated part is blunted by steep retouchings. From a mid-level of Period I. (PRK-1, 438.)

14. Pen-knife blade, sub-type IV B; chalcedony, wax-coloured. Same as above except that the oblique blunting is on the left side, and the lower end is also slightly retouched. No bulb of percussion is available. From an early level of Period I. (PRK-1, 561.)

15. Point, sub-type V A; quartz, translucent. Flake of a triangular transverse section with both edges tapering to a point. The butt-end shows the bulb of percussion and a flake-scar together with a part of the striking-platform which is almost at right angles to the main flake-surface. From the earliest level of Period I. (PRK-1, 563.)

16. Point, sub-type V A; jasper, greenish. Working-tip is broken. Flake of an almost trapezoidal transverse section with the lateral sides tapering to a point which seems to have been slightly retouched. The butt-end shows the bulb of percussion, flake-scar and the striking-platform which is at right angles to the primary flake-surface. From a mid-level of Period I. (PRK-1, 411.)

17. Point, sub-type V B; chalcedony, wax-coloured. Although the tip is broken, the lateral margins show some chippings perhaps due to use. Flake of a triangular transverse section with a shouldered tang at the lower end. The tang-part is blunted to facilitate hafting. The bulb of percussion along with the flake-scar is present at the lowest tip. From a mid-level of Period I. (PRK-1, 560.)

18. Point, sub-type V C; quartz, translucent. Working-edge seems to have been used. Flake of a wedge-shaped transverse section with the right marginal side fully blunted by steep retouchings and carried to a point and the left tapered near the point. The bulbar end is not present. From a mid-level of Period I. (PRK-1, 411.)

19. Point, sub-type V C; rock-crystal. Working-edge seems to be fresh. Flake of a triangular transverse section with the left side throughout blunted by retouching and carried in a curved outline to a point while of the right only the upper part is retouched to strengthen the working-point. The diffused swelling of the bulb of percussion is present. From the earliest level of Period I. (PRK-1, 478.)

20. Point, sub-type V C; chalcedony, wax-coloured. Working-edge is fairly fresh. Flake of a trapezoidal transverse section with both the lateral margins superficially shouldered by steep retouchings and tapered to a point. The lower part of the margins retains the primary flake-cut. The butt-end shows the bulb of percussion and a flake-scar. From a late level of Period I. (PRK-1, 521.)

21. Point, sub-type V D; quartz, translucent. The working-edge is fairly fresh. Flake of a trapezoidal transverse section with the right side throughout blunted to form a symmetrical crescent, while of the left the upper is truncated to form a point whereby it is also retouched. The remaining part of the left side retains the primary flake-cut. No bulb of percussion is available. From a late level of Period I. (PRK-1, 544.)

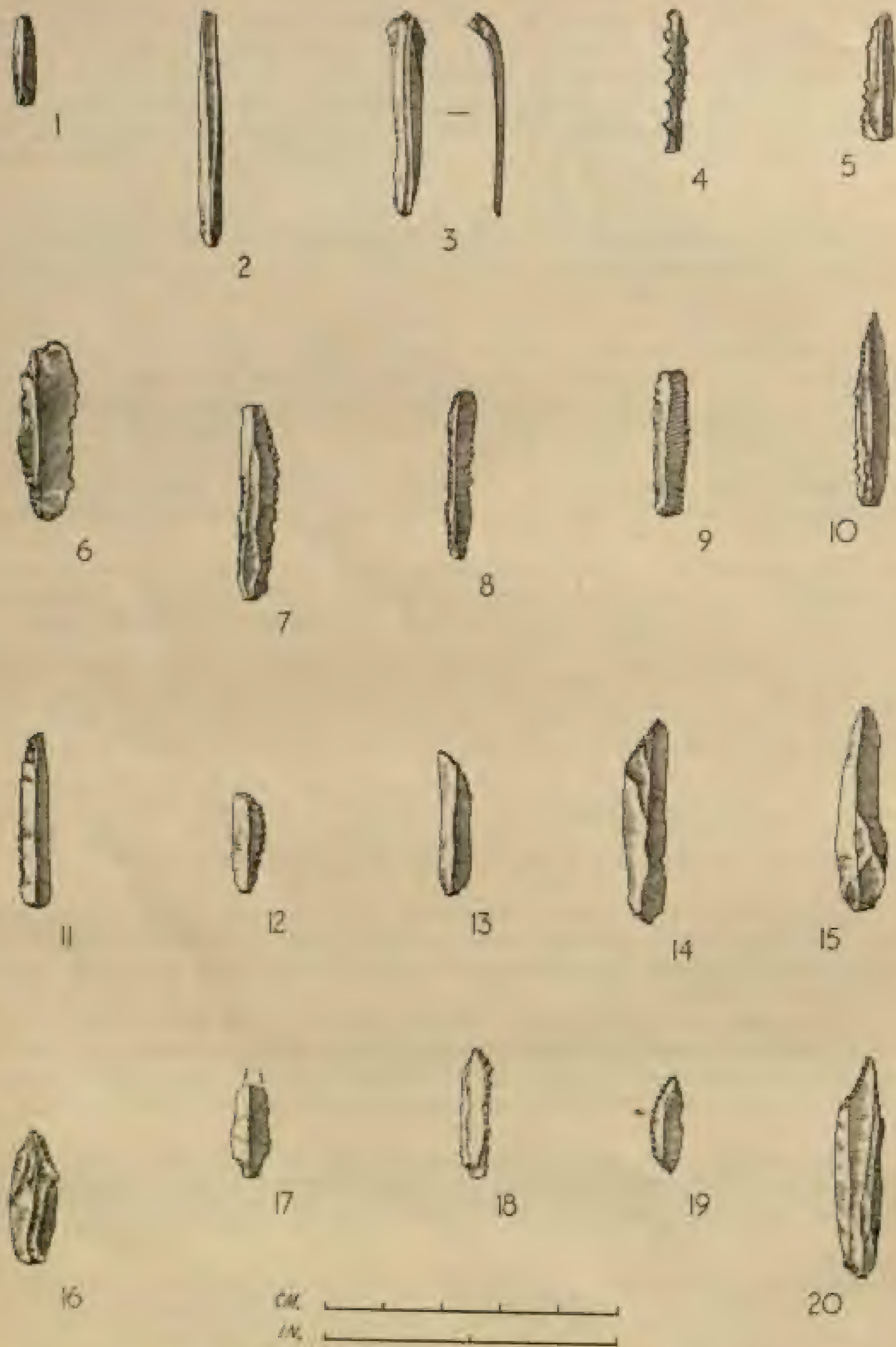
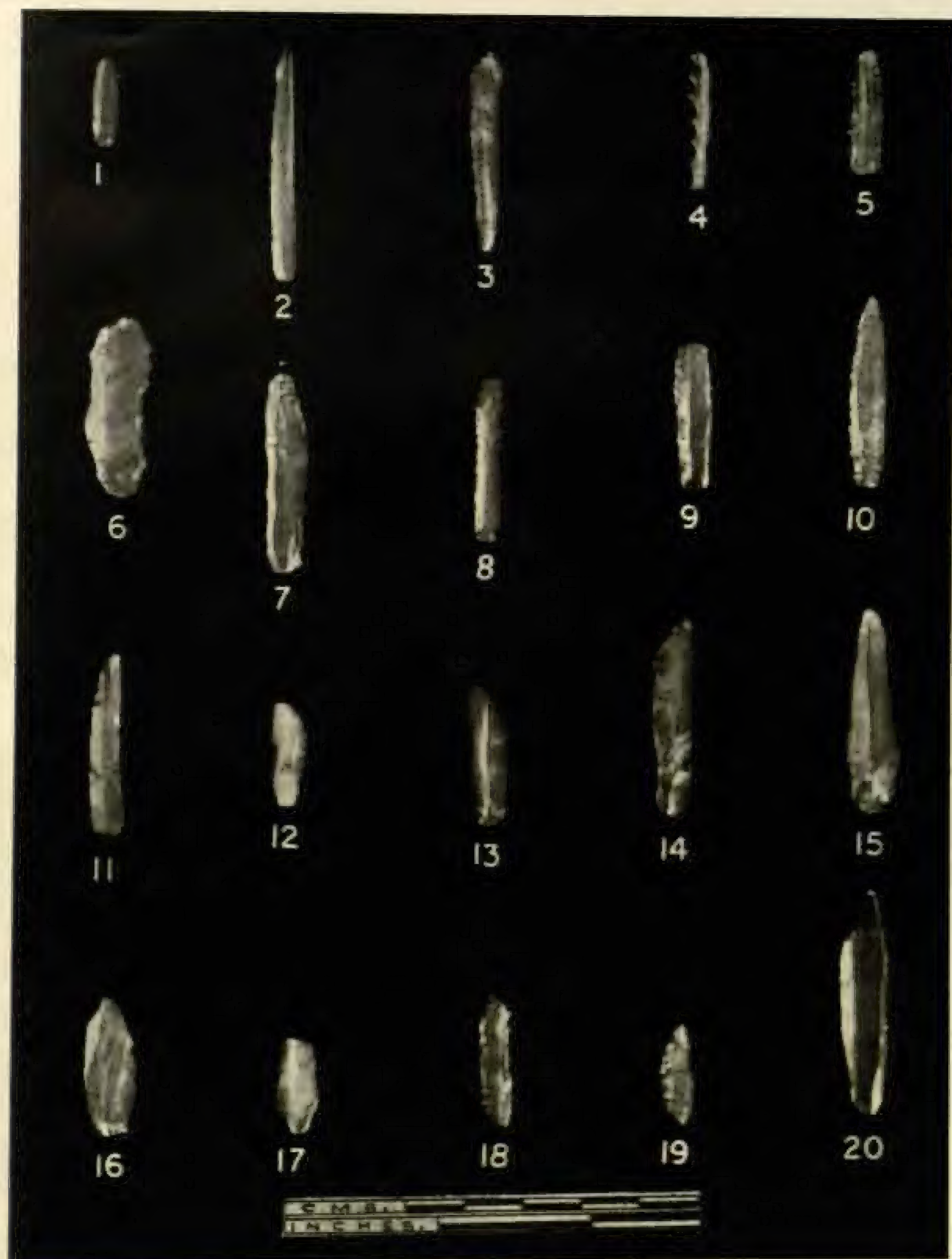
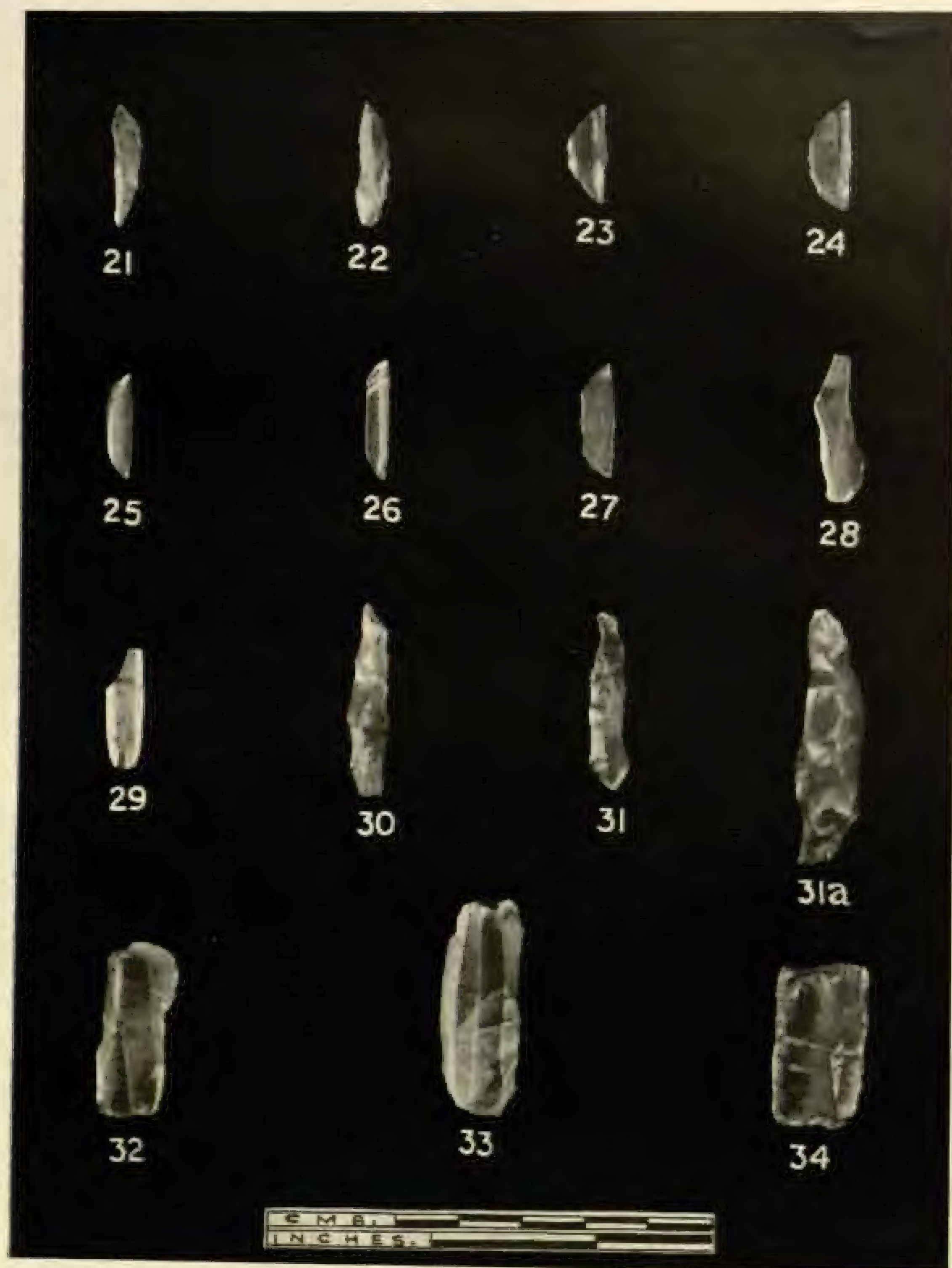


FIG. 33. *Blades and microliths, Period I*



Blades and microliths: 1 to 3, parallel-sided flakes, blades, type I; 4 to 6, serrated blades, type II; 7 to 9, blunted-back blades, type III; 10 to 14, pen-knife blades, type IV; 15 to 20, points, type V. *See pp. 100 and 101*

To face p. 102



Microliths, irregular flakes, crested ridged flakes and cores: 21 and 22, points, type V; 23 to 25, lunates, type VI; 26 and 27, trapezes, type VII; 28 and 29, irregular flakes, type VIII; 30 to 31a, crested ridged flakes, type IX; 32 to 34, cores, type X. See pp. 101 and 103

To face p. 103

22. Point, sub-type V D; agate, white. The working-point is almost fresh. Flake of a triangular transverse section with the right side blunted by steep retouchings and carried to a point in a crescentic outline and the left retaining the primary flake-cut. No bulb of percussion is available. From a late level of Period I. (PRK-1, 400.)

23. Lunate, type VI, rock-crystal. The working-edge, being the lateral chord-side, shows chippings due to use. Flake of an irregular trapezoidal transverse section with the left side blunted by steep retouchings to form a symmetrical arc and the right side, being the chord-part, retaining the primary flake-cut. No bulb of percussion is available. From a mid-level of Period I. (PRK-1, 422.)

24. Lunate, type VI; rock-crystal. The working-edge does not show any signs of use. Flake of a trapezoidal transverse section similar to *23* above. From an early level of Period I. (PRK-1, 492.)

25. Lunate, type VI; chalcedony. The working-edge does not show any signs of use. Flake of a trapezoidal transverse section with the right side sharp and retaining the primary flake-cut and the left side retouched except in the middle portion to form an arc. No bulb of percussion is available. From a late level of Period I. (PRK-1, 389.)

26. Trapeze, type VII; rock-crystal. The working-edge, being the lateral right side does not show any signs of use. Flake of a trapezoidal transverse section with the right edge sharp and throughout having the primary flake-cut and the left side truncated both at the upper and lower ends to form a trapeze. The truncated transverse sides are retouched. The bulbar end is not present. From a mid-level of Period I. (PRK-1, 555.)

27. Trapeze, type VII; rock-crystal. The working-edge shows use-marks. Flake of a trapezoidal transverse section with the same features as above except for the irregular snapping on the truncated side. From the earliest level of Period I. (PRK-1, 493.)

28. Irregular, utilized flake, type VIII; rock-crystal. The working-edge remains indeterminate. Flake of a trapezoidal transverse section, triangular towards the lower end. The right edge shows steep retouchings in a notched fashion. The left margin is truncated towards the top by snapping a thin flake. The bulbar end shows the bulb of percussion, rings and a part of the striking-platform which is at right angles to the main flake-scar. From an early level of Period I. (PRK-1, 416.)

29. Irregular, utilized flake, type VIII; rock-crystal. Use-marks are available on the lateral margin. Flake of a trapezoidal transverse section with both lateral margins retaining the primary flake-cut. The left one, however, is truncated in a shouldered manner for an indeterminated purpose, may be fortuitous. From a late level of Period I. (PRK-1, 526.)

30. Crested-ridged flake, type IX; chalcedony, wax-coloured. Flake of a triangular transverse section showing alternate flaking from the median ridge, and with both margins retaining the primary flake-cut. The bulbar end shows the bulb of percussion and a part of the striking-platform which is at right angles to the flake-surface. From an early level of Period I. (PRK-1, 573.)

31. Crested-ridged flake, type IX; chalcedony, wax-coloured. Flake of a triangular transverse section showing the same features as above. From an upper level of Period I. (PRK-1, 534.) *31a*, (not illustrated by drawing) shows the same features except that it is cruder. From the latest level of Period I. (PRK-1, 376.)

32. Core, type X; chalcedony, light-brownish. Core showing parallel flake-scars and a prepared striking-platform roughly at right angles to the scar-surface. Flakes have been taken from all the sides with the result that the remainder has taken the shape of a cone. The scars indicate ripples and negative bulbs near the platform. From a late level of Period I. (PRK-1, 395.)

33. Core, type X; agate, variegated. Core showing parallel flake-scars and a prepared striking-platform. The underpart shows transverse flake-scars of light trimming, directed from one edge, perhaps for using the core as a scraper. From a late level of Period I. (PRK-1, 530.)

34. Core, type X; chalcedony, grey. Core showing parallel flake-scars and a prepared striking-platform. On a small area of the periphery, the cortex of the nodule is still present. The striking-platform shows soft fluted flake-scars indicative of change in the direction of flaking, perhaps by rejuvenation. From the earliest level of Period I. (PRK-1, 476.)



FIG. 34. *Microliths, irregular flakes, crested ridged flakes and cores, Period I*

B. Stone objects

(i) *Querns and mullers*

The excavation yielded ten querns, all of which are of the legged variety and are made out of basaltic trap. Seven of them came from Period II and three from Period III. These are classified into two types.

Type I (seven examples, six from Period II and one from the overlapped deposit between Periods II and III): stool-type rectangular dressed block with four short tapering legs cut out at each corner. In some cases, however, the legs

are not distinctly differentiated and only show incipient formations with the undersurface not fully dressed. This variety seems to be technologically earlier than that with well-formed legs. One of the specimens in this category shows a shallow circular depression, suggestive of its use perhaps for pounding (fig. 35, *2*; pl. XX, *2*). A specimen with well-formed legs retains a saddle like depression in the mid-part of the upper surface, indicative of its use for grinding (fig. 35, *1*; pl. XX, *1*).

Querns of this type were current essentially in Period II, the earliest occurrence being recorded in the first occupation-level itself. Corroborative evidence is available at Nagda where similar querns are reported from the strata of comparable age.[1] At Navdatoli, however, these are reported from the earlier chalcolithic levels as well.[2] In this connexion it may be mentioned that this type is technologically also earlier than the Adichanallur example, which besides having an incipient projection on one side, shows clearly differentiated legs of defined dimensions.[3]

Type II (three examples, one from Period II and two from Period III): stool-type but with one end projecting beyond the axis of the legs—rectangular block with four well-cut legs, two of them being placed slightly in the interior leaving at one end a protruding part, which, during use, was intended to be kept at the farther distance from the operator. The type was in vogue essentially during the earlier half of Period III, the solitary example from Period II being recovered from the late levels of the Period in noteworthy association with the Northern Black Polished Ware.

An account of the typology as also a tentative dating for this variety of legged querns has already been attempted[4] and has, in fact, provided the necessary basis for any reliable and detailed classification. The evidence at Prakash is, in general, consistent with the findings at Tripurī, Maheshwar and Nevasa, where such types of legged querns range between the second century B.C. and the third-fourth century A.D.[5] At Ujjain and Nagda, however, legged querns of identical shape are also found in the earlier strata ascribable to the fifth century B.C. and continue till as late as the tenth century A.D.

Of the six mullers recovered from the dig, two are from Period II and four from Period III, the material used being either sandstone or trap. These are principally of two varieties: (a) with oval, elliptical and lenticular section and heavier ends shaped like a dumb-bell, and (b) cylindrical with perfectly circular section. Both these varieties, excepting perhaps one example (fig. 35, *7*; pl. XX, *7*), were operated by both the hands held together. In case of the former, however, the heavier ends protruded from the width of the quern which was smaller than the overall length of the muller.

Besides, three rubber-like flat objects, squarish in outline, but with a trapezoidal section and slightly convex undersurface, were also found. These were invariably of trap. Two of these came from Period II and the remaining one from Period III. Although nothing can be said with any assurance about the method of their use, it is surmised that

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[1] Information from Dr. N. R. Banerjee.

[2] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 234.

[3] *An. Rep. Arch. Surv. Ind., 1902-03* (Calcutta, 1904), p. 139.

[4] *Explorations at Karad*, Bharata Itihasa Samshodhaka Mandala Svīya-Grantha-mālā, no. 74 (Poona, 1949), p. 26 and pl. XII A; H. D. Sankalia, 'Cultural significance of saddle querns', *Jour. Anthr. Soc. Bombay*, New Series, IV, no. 1 (1950), pp. 35-39; M. G. Dikshit, *Tripuri—1952* (Nagpur, 1955), pp. 105-09; K. D. Banerjee, 'Querns and anvils from the Narmada valley', *Bulletin of the Deccan College and Research Institute*, XVIII (1957), pp. 8-16.

[5] K. D. Banerjee, *op. cit.*, pl. 2.

these may have been used for pounding by rocking along the convex side, which in some cases shows a smoothened surface. Alternately, they may have been small saddle-querns of the type recovered at Nevasa.[1]

Fig. 35; pl. XX

1. Quern, type I; trap, four-legged. The upper surface shows a saddle-like end-to-end depression. From a mid-level of Period II. (PRK-1, 614.)

2. Quern, type I; trap, four-legged. The upper surface shows a shallow circular depression. The legs are not clearly defined nor is the undersurface fully dressed. From an early level of Period II. (PRK-1, 536.)

3. Quern, type II, trap, four-legged. One end of the upper surface protrudes beyond the axis of the legs. From an early level of Period III. (PRK-1, 313.)

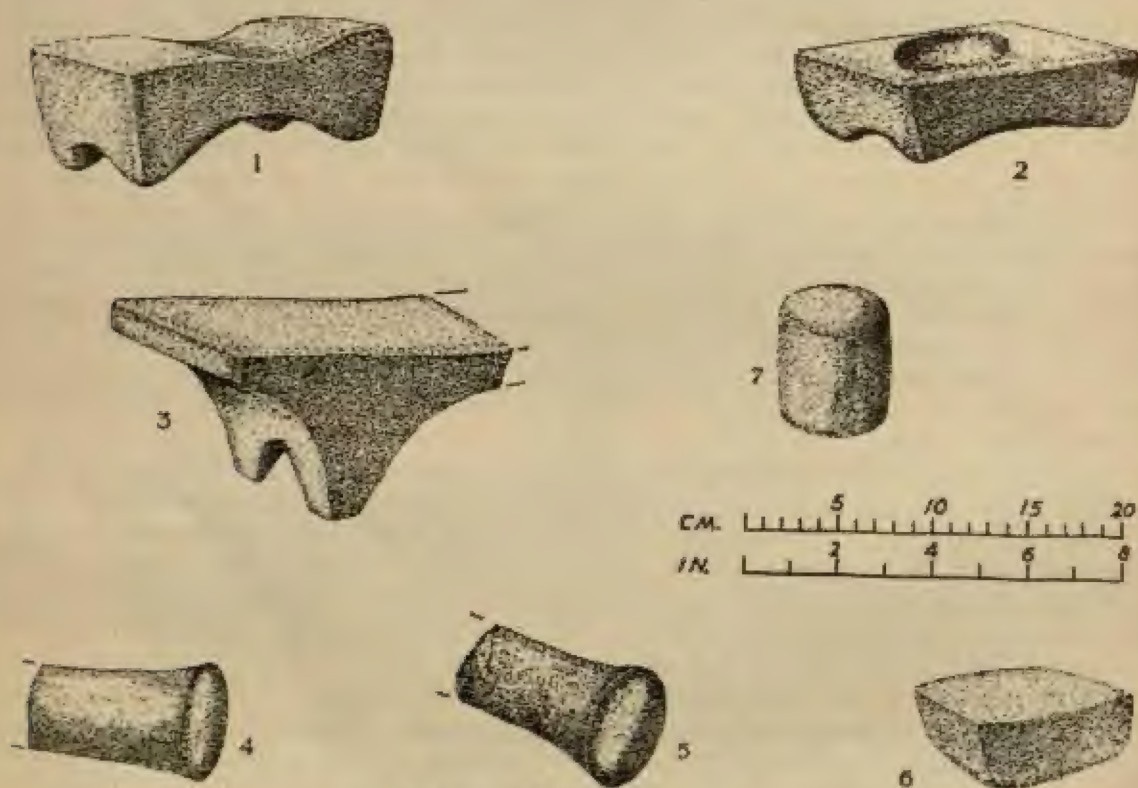


FIG. 35. *Querns and mullers*

4. Muller; sandstone, cylindrical with dumb-bell-shaped heavier ends and an oval section. One end is broken. From an early level of Period II. (PRK-1, 330.)

5. Muller; sandstone, cylindrical with dumb-bell-shaped heavier ends and a lenticular section. From an early level of Period III. (PRK-1, 298.)

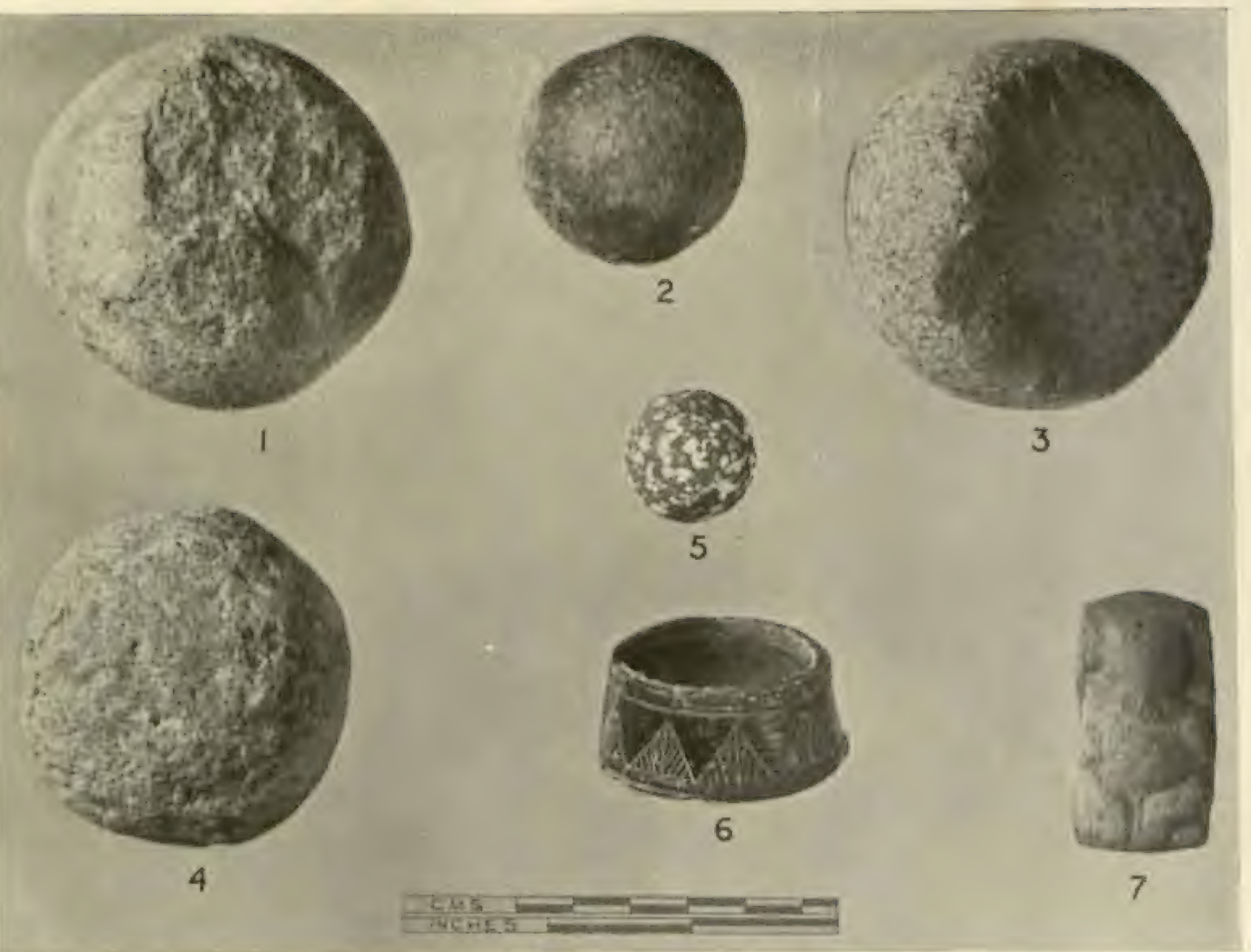
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[1] Sankalia, Deo, Ansari, and Ehrhardt, *op. cit.* (1960), p. 473, fig. 204.



Querns and mullers: 1, 2, 4 and 6, Period II; 3, 5 and 7, Period III. *See pp. 106 and 107*

To face p. 106



Other stone objects: 1, 2 and 3, Period I; 4 and 6, Period III; 5 and 7, Period IV. *See p. 107*

To face p. 107

6. Rubber-like object; trap, squarish with a trapezoidal section and slightly convex undersurface. From a mid-level of Period II. (PRK-1, 497.)

7. Muller or pounder; trap. Cylindrical with a circular section. From an early level of Period III. (PRK-1, 281.)

(ii) *Other objects*

Other stone objects recovered from the excavation include four balls, essentially spheroids, three discular spheroids, two marbles, a disc, a decorated casket and a Gaṇeśa image. Noteworthy amongst these, however, are the spheroid balls, circular or discular in outline. These seem to have been fashioned out of dyke-material and smoothed around the periphery by rubbing or by means of some abrasives, may be sand. The hypothetical use as slingstone or hammerstones to which these spheroids could have been used has already been pointed out and needs no reiteration.[1] Of the four specimens of the circular variety, three came from Period I and one from Period III. The specific use to which the discular spheroids were put is again problematical. Their thickness was determined by the thickness of the cleavage of the dyke-material. The flat surface in this case is original, while the remaining spheroidal profile is made by rubbing. These could as well be employed as rubbers. All the three specimens of this variety came from Period I. Similar hammerstones have been recovered from Navdatoli and Nevasa[2], mostly from the chalcolithic strata. The selected specimens are listed below.

Fig. 36; pl. XXI

1. Discular spheroid; dolerite. The battered flat sides retain the original surface. From a late level of Period I. (PRK-1, 616.)

2. Circular spheroid; dolerite. From the latest level of Period I. (PRK-1, 388.)

3. Discular spheroid; dolerite. The flat sides retain the original surface. From a mid-level of Period I. (PRK-1, 617.)

4. Circular spheroid; dolerite. From a late level of period III. (PRK-1, 242.)

5. Marble; sandstone. From an early level of Period IV. (PRK-1, 619).

6. Casket; soapstone. Decorated with incised hachured triangles. From a mid-level of Period III. (PRK-1, 620.)

7. Gaṇeśa image; sandstone. It is a seated image with only one pair of arms. The shape of the elephant-head is natural. The trunk is turned which seems to rest on the *modakas* held in the left hand. From a mid-level of Period IV. (PRK-1, 143). Similar Gaṇeśa figurines have been recovered from Maheshwar where they are placed between the fifth and sixth century A.D., but could be later also.[3] Here, however, on the basis of stratification and relative sequence of other datable finds of Period III, viz. *aṅkadhātri* type terracotta figurine (below, pp. 118-19; pl. XXV A, *1*,) and a coin (below, p. 130; pl. XXVII C, *2*), it could be ascribed to *circa* eighth-ninth century A.D.

C. Beads[4]

The excavation, limited as it was to a single cutting, yielded a total of one hundred and thirtynine beads, distributed as follows: Period I, sixteen; Period II, fortyseven; Period

[1] Thapar, *op. cit.*, p. 103.

[2] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 239, fig. 115; Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 470.

[3] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 242.

[4] The method of classification adopted here is that of H. C. Beck, 'Classification and nomenclature of beads and pendants', *Archaeologia*, LXXVII (1928), pp. 1 ff.

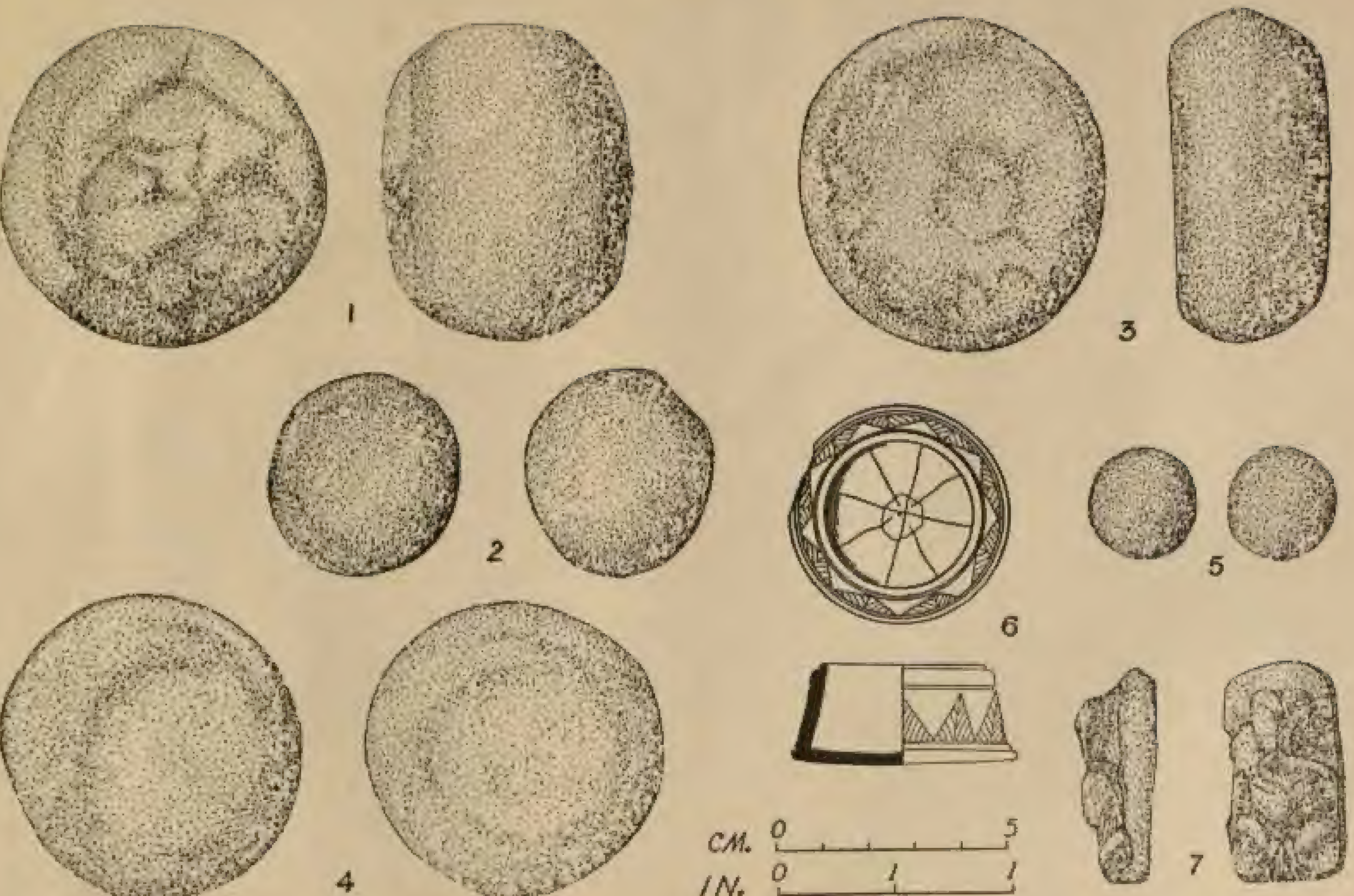


Fig. 36. *Other stone objects*

III, twentyfour ; Period IV, fiftyone; and unstratified, one. The presence of a few unfinished specimens in various stages, however, indicates that the beads were manufactured also locally.

The materials used for the manufacture of these beads include: semi-precious stones like quartz, rock-crystal, carnelian, agate and jasper; coral; shell; glass; paste; bone; and terracotta. From the appended Table IV (below, p. 111), it will be seen that semi-precious stones alone account for 48·8 per cent of the total yield with carnelian and rock-crystal claiming 28·0 and 13·6 per cent respectively. Quartz, agate and jasper seem to have been sparingly employed. Amongst the remaining material, terracotta, glass and shell show a fairly sizable percentage. Besides the prime favourite carnelian and coral, no other material was represented in all the Periods, although this phenomenon, in view of the restricted nature of the excavation, may not be emphasized.

The represented shapes (Table V, below, p. 112 A) include spherical, cube, barrel, cylinder, convex, bicone, chevron, circular, disc, cone, gadrooned, gourd, pear or arecanut, segmented or double; there are also pendants including animal-amulets. Some of these principal shapes have been further divided into sub-varieties on the basis of their length and transverse section. Of these, the basic shapes like the spherical, the barrel, the cylinder and the bicone started in Period I and continued with modifications or elaborations in the succeeding Periods. Apart from the pear or areca nut shapes, available only in terracotta, the other popular shapes were the spherical, the long barrel circular, the long cylinder circular and the standard bicone hexagonal. Besides, mention may be made of certain noteworthy shapes like the chevron, the concave cone and the animal-amulets which are confined only to a particular stratum.

The materials together with the range of shapes are dealt with below in order of frequency.

Carnelian accounts for the largest number (thirtynine) and is found in all the Periods, five being from Period I, eighteen from Period II, four from Period III and twelve from Period IV. A common shape in this material is the bicone, of which an example, from Period I, is standard circular, while eight, from Periods II and IV, are standard truncated square faceted (fig. 37, *24;* pl. XXII, *24*). One of the related shapes is convex truncated square faceted from Period I. A noteworthy shape, however, is the chevron, or chain, presumably copied from a metal prototype. The teeth of the chevron are so ingeniously fashioned as to dovetail into each other for purposes of threading in a chain (fig. 37, *30;* pl. XXII, *30*). Similar beads in shell, steatite and faïence have been reported from Mohenjo-daro.[1] Chain beads of varying shapes have also been collected from Kauśāmbi.[2] The dynamic quality of the design and the workmanship speaks highly of the bead-industry. Five such beads were recovered in a lump from a deposit of Period II. The remaining shapes include : spherical (eleven examples) from all the Periods (fig. 37, *1;* pl. XXII, *1*); long barrel circular (fig. 37, *8;* pl. XXII, *8*) (three examples), from Periods II and III; circular tabular and short convex (one example each), from Period IV; short convex circular (one example), from Period II; long convex hexagonal (fig. 37, *20*; pl. XXII, *20*) (four examples), from Period IV; long barrel hexagonal (one example), from Period I; cube (fig. 37, *27*; pl. XXII, *27*) (one example), from Period I. Of the same material was a claw-shaped pendant (fig. 38, *36*; pl. XXII, *36*), from Period III.

[1] E. J. H. Mackay, *Further Excavations at Mohenjo-daro*, II (Delhi, 1937-38), pls. CXI, *22*; CXXXVI, *55, 56, 65*; CXXXIX, *59, 60*, and p. 509.

[2] Dr. M. G. Dikshit's personal collection.

Rock-crystal was next in order of frequency amongst the semi-precious stones and was represented by nineteen beads, of which eighteen come from Period II alone and the remaining one from Period III. Of the former as many as fifteen are standard bicone hexagonal (fig. 37, *23*; pl. XXII, *23*); one each is long cylinder circular (fig. 37, *7*; pl. XXII, *7*), long barrel circular (fig. 37, *14*; pl. XXII, *14*) and thick tabular (fig. 37, *26*; pl. XXII, *26*). The solitary example from Period III is a long convex imperfect hexagonal (fig. 37, *21*; pl. XXII, *21*).

Of the six quartz beads, the spherical ones (fig. 37, *3*; pl. XXII, *3*) (two examples) are of the milky variety and come from Period IV, the remaining being long barrel circular (two examples) from Period II, and standard truncated bicone hexagonal (one example) from Period II. One example from Period III is unfinished.

Jasper accounted for two beads, both from Period II. The shapes represented are spherical (fig. 37, *2*; pl. XXII, *2*) and standard bicone hexagonal (fig. 37, *22*; pl. XXII, *22*).

Agate, banded variety, is the material for two examples; one unbored long barrel circular from Period II and one spherical deformed (fig. 37, *4*; pl. XXII, *4*) from Period IV.

Coral accounted for six beads, two being from Period I and one each from Periods II, III, IV and the unstratified deposit. The shapes represented include: disc (fig. 37, *29*; pl. XXII, *29*) (two examples), one each from Period I and the unstratified deposit; long cylinder circular (fig. 37, *10*; pl. XXII, *10*) (three examples), from Periods I, II, and IV; and short barrel circular (one example), from Period III.

Shell formed the material for nine beads, distributed as follows: Period I, five; Period III, one; and Period IV, three. A noteworthy shape is the tortoise-amulet (fig. 37, *31*; pl. XXII, *31*) from Period I. Similar amulets are also found at Taxila in the historical period, three from Sirkap and two from the Dharmarājikā Stūpa[1] and at Sahri Bahlol, Kauśāmbī, Kumrahar, Rajghat, Ahichchhatrā and Sambhar.[2] Tortoise-amulets have also been reported from Ujjain from levels ascribable to fifth-second century B.C. Tortoises of terracotta, in slightly larger size and perforated at the neck, possibly meant as toys, are also found in the early historical levels of the same site.[3] Its occurrence at Prakash in the chalcolithic strata (late levels) is significant. Other shapes met with include: a spacing-bead, standard concave cone (fig. 38, *32*; pl. XXII, *32*) (one example), from Period I; pendant, possibly tooth-pick (fig. 38, *33*; pl. XXII, *33*), from Period I; standard cylinder circular (fig. 37, *6*; pl. XXII, *6*) (two examples), one each from Periods III and IV; standard barrel circular (one example), from Period IV; and short barrel circular (fig. 37, *28*; pl. XXII, *28*) (one example), from Period I; and unbored truncated bicone from Period I. One specimen from Period IV is unfinished.

Glass beads number nineteen, of which as many as fourteen come from Period IV and the remaining five from Period III. The colours represented are yellow, shades of green, blue and black, besides the composite ones with a yellow matrix and green coating (fig. 37, *12*; pl. XXII, *12*). The collection includes one bead each of banded cane (fig. 37, *5*; pl. XXII, *5*), gadrooned (fig. 37, *25*; pl. XXII, *25*) and segmented or double (fig. 37, *16*; pl. XXII, *16*) variety and one mallet or club-shaped pendant (fig. 37, *34*;

[1] H. C. Beck, *The Beads from Taxila*, Mem. Arch. Surv. Ind., no. 65 (Delhi, 1941), pp. 18 and 55-56 and pl. VII, *22-26*.

[2] M. G. Dikshit, 'Notes on some Indian amulets', *Bulletin of the Prince of Wales Museum*, no. 2 (1953), pp. 92 and 93.

[3] Information from Dr. N. R. Banerjee.

pl. XXII, *34*). Other shapes comprise: barrel (fig. 37, *13;* pl. XXII, *13*) (seven examples), from Period IV; spherical (one example), from Period IV; long cylinder circular (fig. 37, *9*; pl. XXII, *9*) (five examples), from Periods III and IV; standard convex and gourd (fig. 37, *17* and *19;* pl. XXII, *17* and *19*) (one example each) and a long cylinder square faceted resembling a cornerless cube (?) (fig. 37, *12;* pl. XXII, *12*) (one example), from Period IV.

The beads were made either by spirally winding or by drawing canes and or by simple drawing of the viscous matter on the tip of an instrument. Besides, the distinctive technique of perforating these by a poker, which produces a burred edge on one side, is also evident on some beads (fig. 37; *17;* pl. XXII, *17*).

Of the five paste beads, two were recovered from Period I and the remaining three from Period IV. The former are standard truncated bicone (fig. 37, *18;* pl. XXII, *18*) and disc, while the latter are standard barrel (two examples) and long cylinder circular (one example).

TABLE IV

PERIOD-WISE DISTRIBUTION OF BEADS CLASSIFIED ACCORDING TO MATERIAL

MATERIAL / PERIOD	I	II	III	IV	UN-STRATI-FIED	TOTAL	PER-CENT-AGE
Semi-precious (silicon minerals):							
Quartz	—	3	1	2	—	6	*4·4*
Rock-crystal	—	18	1	—	—	19	*13·6*
Carnelian	5	18	4	12	—	39	*28·0*
Agate	—	1	—	1	—	2	*1·4*
Jasper	—	2	—	—	—	2	*1·4*
Coral	2	1	1	1	1	6	*4·4*
Shell	5	—	1	3	—	9	*6·4*
Glass	—	—	5	14	—	19	*13·8*
Paste	2	—	—	3	—	5	*3·5*
Terracotta	—	3	10	15	—	28	*20·1*
Bone	—	1	—	—	—	1	*0·7*
Indeterminate	2	—	1	—	—	3	*2·1*
TOTAL	16	47	24	51	1	139	
PERCENTAGE	*11·5*	*33·8*	*17·2*	*36·6*	*0·7*		

The solitary example of bone bead is a long barrel circular with a slight necking to one side (fig. 37, *15;* pl. XXII, *15*) from Period II.

Terracotta accounted for twentyeight beads, three being from Period II, ten from Period III and fifteen from Period IV. A delicately-moulded pendant from Period II (fig. 38, *41*; pl. XXIIIA, *41*) deserves special attention. The remaining examples are essentially pear- or arecanut-shaped in varying stages of truncation (fig. 38, *37* to *40* and *42*). The specific use of this shape is problematical; it could be used as a bead, equally as a spindle-whorl or a net-sinker. The perforation of one of the beads still retains an iron pin, indicating that the bead may have been used either as a pendant or as a terminus of a spindle-whorl or some such indeterminate object.

Besides these, three beads, two from Period I and one from Period III, are of an indeterminate material, possibly plain stone. The shapes comprise long cylinder circular (fig. 38, *35*; pl. XXII, *35*) and long barrel circular, from Period I, and long cylinder square (fig. 37, *11;* pl. XXII, *11*), from Period III.

The selected examples are listed below.

Figs. 37 and 38; pls. XXII and XXIII A

1. Carnelian: spherical. From a mid-level of Period I. (PRK-1, 562.)

2. Jasper: spherical. From the overlapped levels of Periods II and III. (PRK-1, 442.)

3. Quartz, milky: spherical. From a late level of Period IV. (PRK-1, 9.)

4. Agate, banded opaque: spherical deformed. From a late level of Period IV. (PRK-1, 2.)

5. Glass showing white bands with black formed by canes: long barrel circular, slightly deformed due to chopping. From a mid-level of Period IV. (PRK-1, 49.)

6. Shell: standard cylinder circular. From a late level of Period IV. (PRK-1, 22.)

7. Rock-crystal: long cylinder circular. From an early level of Period II. (PRK-1, 499.)

8. Carnelian: long barrel circular. From a mid-level of Period III. (PRK-1, 267.)

9. Glass made from canes with patches of red over black surface possibly swirled, opaque: long cylinder circular. From an early level of Period IV. (PRK-1, 82.)

10. Coral: long cylinder circular, slightly bent in the middle. From a late level of Period II. (PRK-1, 396.)

11. Indeterminate stone, spotted grey: long cylinder squarish, the perforation being not in one level. From a late level of Period III. (PRK-1, 108.)

12. Glass, layered, green (horizontally hatched in the drawing) over yellow matrix made of canes: long cylinder squarish, similar to cornerless cube. From an early level of Period IV. (PRK-1, 121.)

13. Glass, light-green with white bands, opaque: long barrel circular. From a late level of Period IV. (PRK-1, 119.)

14. Rock-crystal: long barrel circular. From a mid-level of Period II. (PRK-1, 455.)

15. Bone: long barrel circular with a slight necking to one side. From a late level of Period II. (PRK-1, 224.)

16. Glass, dirty violet, wire-wound: segmented (double) circular. From an early level of Period IV. (PRK-1, 146).

17. Glass, green, copper-coloured having a burred edge and worn out by use, showing slight signs of disintegration: standard convex circular. From an early level of Period IV. (PRK-1, 153.)

18. Paste: standard truncated bicone circular. From an early level of Period I. (PRK-1, 417.)

TABLE V

PERIOD-WISE DISTRIBUTION OF BEADS CLASSIFIED ACCORDING TO SHAPE

Shapes \ Period		I	II	III	IV	Unstratified	Total	Percentage
	Spherical	1	4	2	9	—	16	*11·5*
	Cube	1	—	—	—	—	1	*0·7*
Barrel	Long circular	1	7	1	7	—	16	*11·5*
	Long hexagonal	1	—	—	—	—	1	*0·7*
	Standard circular	—	—	—	3	—	3	*2·1*
	Short	1	—	1	—	—	2	*1·4*
Cylinder	Long circular	2	2	3	4		11	*7·1*
	Long square	—	—	1	1	—	2	*1·4*
	Standard circular	—	—	1	1	—	2	*1·4*
Convex	Long hexagonal	—	—	1	4	—	5	*3·5*
	Standard circular	—	—	—	1	—	1	*0·7*
	Standard square faceted	1	—	—	—	—	1	*0·7*
	Short circular	—	1	—	—	—	1	*0·7*
Bicone	Standard circular	3	—	—	—	—	3	*2·1*
	Standard square	—	7	—	1	—	8	*5·7*
	Standard hexagonal	—	17	—	—	—	17	*12·2*
Circular	Chevron	—	5	—	—	—	5	*3·5*
	Tabular	—	—	—	1	—	1	*0·7*
	Short convex	—	—	—	1	—	1	*0·7*
	Standard cylinder	—	1	—	—	—	1	*0·7*
Disc		2	—	—	—	1	3	*2·1*
Short concave cone		1	—	—	—	—	1	*0·7*
Gadrooned		—	—	1	—	—	1	*0·7*
Gourd		—	—	1	—	—	1	*0·7*
Pear/arecanut		—	2	10	15	—	27	*19·4*
Segmented (double)		—	—	—	1	—	1	*0·7*
Animal-amulet		1	—	—	—	—	1	*0·7*
Pendant		1	1	2	—	—	4	*2·8*
Shapeless		—	—	1	1	—	2	*1·4*
TOTAL		16	47	24	51	1	139	
PERCENTAGE		*11·5*	*33·8*	*17·2*	*36·6*	*0·7*		



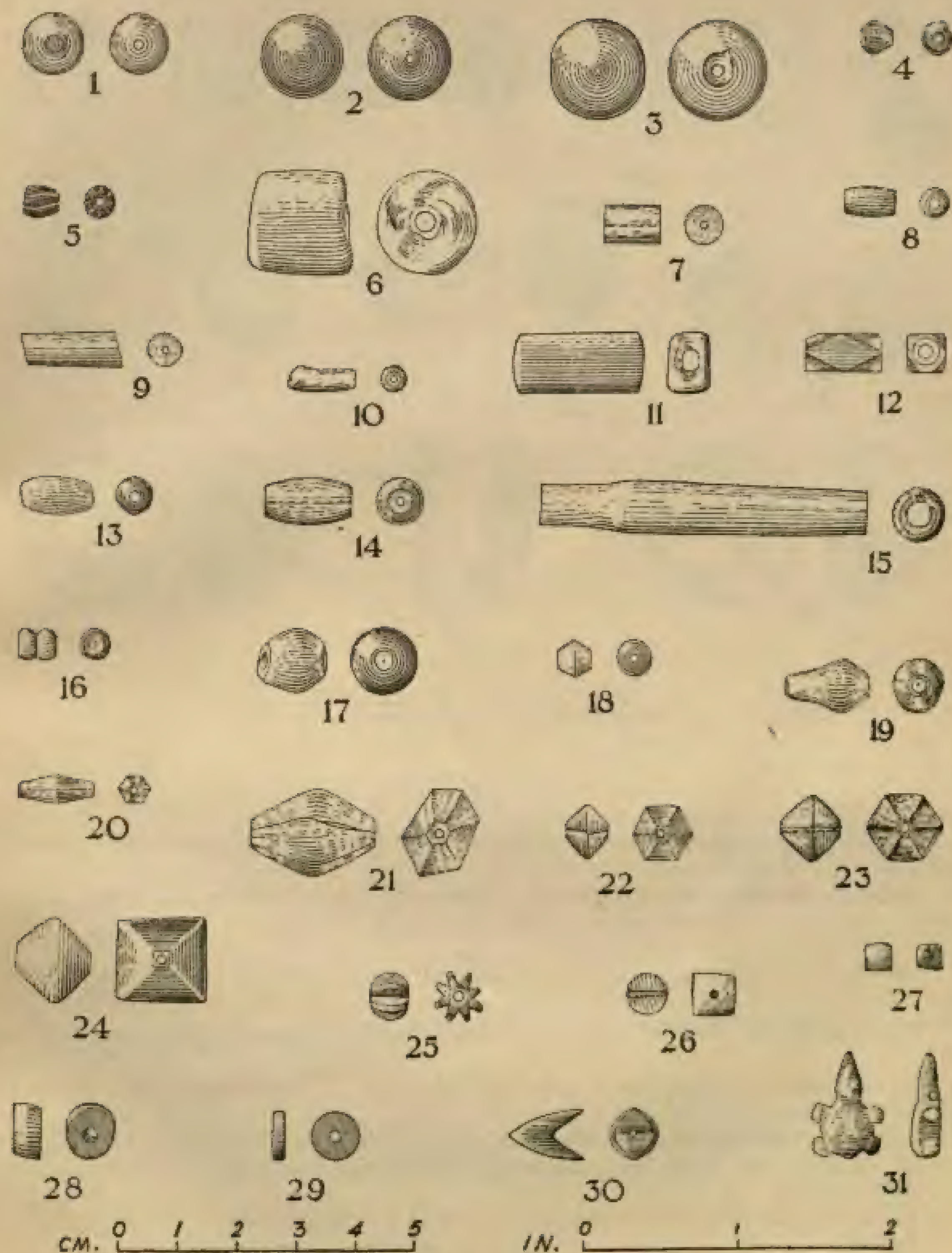

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FIG. 37. *Beads*

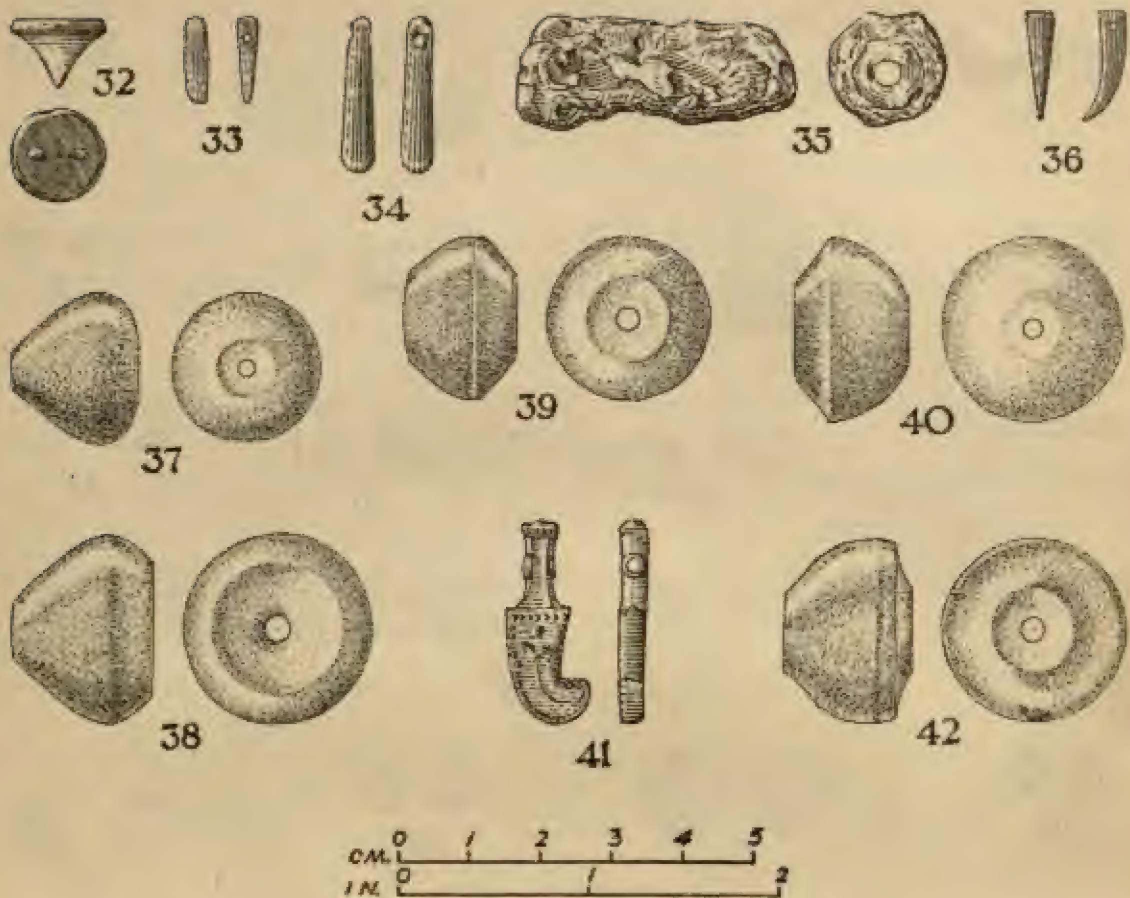


FIG. 38. *Beads*

19. Glass, light-green translucent, wound and fire-polished: gourd-shaped. From a mid-level of Period IV. (PRK-1, 27.)

20. Carnelian: long convex hexagonal. From an early level of Period IV. (PRK-1, 167.)

21. Rock-crystal: long convex imperfect hexagonal. From a mid-level of Period III. (PRK-1, 433.)

22. Jasper: standard bicone truncated hexagonal. From a mid-level of Period II. (PRK-1, 458.)

23. Rock-crystal: standard bicone hexagonal. From the same level as above. (PRK-1, 466.)

24. Carnelian: standard truncated bicone square faceted. From an early level of Period II. (PRK-1, 366.)

25. Glass, yellow, opaque: gadrooned. From an early level of Period III. (PRK-1, 322.)

26. Rock-crystal: circular thick tabular (standard cylinder). From an early level of Period II. (PRK-1, 531.)

27. Carnelian: cube. From a late level of Period I. (PRK-1, 543.)

28. Shell: short barrel circular. From a mid-level of Period I. (PRK-1, 414.)

29. Coral: disc. From the same level as no. *27.* (PRK-1, 393.)

30. Carnelian: chevron. Five such beads were recovered in one lump. From a mid-level of Period II. (PRK-1, 487.)

31. Shell: amulet, tortoise-shaped. From a late level of Period I. (PRK-1, 533.)

32. Shell: spacing bead, standard concave cone. From a mid-level of Period I. (PRK-1, 548).

33. Shell: pendant tooth-pick, chisel-ended. From the same level as above. (PRK-1, 430.)

34. Glass, green, copper coloured, translucent: pendant, mallet-shaped. From an early level of Period III. (PRK-1, 448.)

35. Indeterminate stone: long cylinder circular. From a late level of Period I. (PRK-1, 552.)

36. Carnelian: pendant, claw-shaped. From the latest level of Period III. (PRK-1, 301.)

37. Terracotta: pear-shaped. From the overlapped levels of Periods II and III. (PRK-1, 290.)

38. Terracotta: pear-shaped. From a late level of Period III. (PRK-1, 148.)

39. Terracotta: arecanut-shaped, truncated at the top and with a medial groove. From the same level as above. (PRK-1, 133.)

40. Terracotta: arecanut-shaped with a carinated profile and truncated sides. From a late level of Period III. (PRK-1, 118.)

41. Terracotta: pendant, scabbard-shaped. From a pit ascribable to a late level of Period II. (PRK-1, 261.)

42. Terracotta: pear-shaped with a carinated profile and truncated at both ends. From a mid-level of Period IV. (PRK-1, 154.)

D. Bangles and rings

A total of two hundred and fortyeight bangle-fragments, mostly of shell and glass, were recovered from the excavation, with shell accounting for nearly 80 per cent of the total yield. Other materials represented are copper (four examples) and iron (one example), illustrated below, pp. 121 and 127 respectively.

Of the fortyfive glass bangles recovered from the excavation, two came from Period II, four from Period III, thirtyeight from Period IV and one from an unstratified deposit. The occurrence of monochrome bangles in the earliest levels of Period II is, however, noteworthy. Attention has already been drawn to the desirability of closer observation for the occurrence of glass bangles in the pre-Christian era.[1] The evidence must be re-examined as knowledge advances. Excavations at Nagda and Ujjain have also indicated the use of monochrome glass bangles in *circa* sixth-fifth century B.C.[2] Corroborative evidence is also available at Śrāvastī, where translucent sea-blue or light-green monochrome glass bangles have been found in association with the Northern Black Polished Ware.[3]

The monochrome glass bangles met with at Prakash are of two varieties, viz. the translucent and the opaque. Of these, the former, available in light-green and blue colours and with pentagonal and circular sections, is stratigraphically earlier than the latter, represented in black, green and lapis lazuli blue colours and having circular, rectangular

[1] Thapar, *op. cit.*, pp. 112 and 113.

[2] Information from Dr. N. R. Banerjee.

[3] Information from Dr. K. K. Sinha.

and plano-convex sections. Black-coloured bangles are more abundant in Period IV. Quite a number of them are not completely circular. The occurrence of such deformed examples bespeaks a local industry. Whereas the translucent variety with pentagonal section seems to have been manufactured by the use of a mould, a majority of the opaque bangles were apparently made by pulling out the plastic glass to the required shape.

Eight examples of the bichrome and polychrome variety of glass bangles were also found in Period IV, from the strata upwards of layer 13. The bichrome ones show a basal black or tan band over which either a plain thin strip or a design in yellow or dots are applied and fused with the body. In the polychrome ones, combinations of yellow and green over basal black in pleasing contrast are much in evidence. The occurrence of polychrome glass bangles in levels ascribable to the close of the first millennium A.D. is also corroborated at Ujjain[1] and Yeleswaram.[2] Hitherto it was known to occur only around the fourteenth century A.D.[3]

Shell bangles (one hundred and ninetyeight examples) were distributed over all the Periods, four being from Period I, fourteen from Period II, one hundred and sixteen from Period III, thirtynine from Period IV and twentyfive from the unstratified deposits. The occurrence of shell bangles in chalcolithic assemblage is also attested at Navdatoli,[4] Nevasa,[5] and Nagda,[6] but curiously enough is not corroborated at the southern Deccan sites of Brahmagiri[7] and Maski.[8] A few sawn conch-shells, found in various levels, denote a local industry which seems to have reached its floruit in Period III with a yield of nearly 60 per cent of the total. A noteworthy feature of the industry is the ornamentation which, alike in the harmony of design and the skilful execution of details, displays a sophisticated art. As an ornament they were considered fairly precious, for broken fragments are sometimes found riveted with copper pins (pl. XXIV, *16*). Decorated bangles are available right from Period I onwards but seem to be extensively in use in Periods III and IV. The decoration which is done essentially on the outer surface, sometimes also extending to the sides, exhibits a wide range of patterns, the commonest of which is the circular or heart-shaped button in bold relief, carved on that part of the circumference which shows an inward bend or projection due to the structural feature of the conch (pl. XXIV, *12* and *13*). Other designs include such motifs as rope- or twine-lines (pl. XXIV, *22* and *23*), milled or file-edge (pl. XXIV, *21*), chain or bead (pl. XXIV, *18*), herring-bone, oscillation (pl. XXIV, *24*) and floral panels (pl. XXIV, *17*, *20*, *25* and *29*). In transverse sections, the bangles are either plano-convex, squarish, oblong, slightly elliptical or sometimes channelled. The channelled part was possibly meant for some inlay as evidenced by the traces of gold leaf sticking to some of the bangles with similar section at Maheshwar and Nevasa.[9] In diameter, they range from 3·5 cm. to 6 cm., with the latter as the norm which possibly was the size for the adults. It may,

[1] Information from Dr. N.R. Banerjee.

[2] Md. Abdul Waheed Khan, *A Monograph on Yeleswaram Excavations* (Hyderabad, 1963), p. 17.

[3] Sankalia, Deo, Ansari, and Ehrhardt, *op. cit.* (1960), p. 447.

[4] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 228.

[5] Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 459.

[6] Information from Dr. N. R. Banerjee.

[7] R. E. M. Wheeler, 'Brahmagiri and Chandravalli 1947: megalithic and other cultures in Mysore State', *Ancient India*, no. 4 (1947-48), p. 260.

[8] Thapar, *op. cit.*, p. 111.

[9] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 229; Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 452.

however, be added that the diameter-size is only approximate, for none of the bangles were perfectly circular.

The excavation also yielded five rings, two of copper (below, p. 122) and three of glass. The latter are represented in translucent red (pl. XXIII B, *9*), opaque blue and green, and measure on an average 2 cm. in diameter.

The selected specimens are listed below.

Pls. XXIII B and XXIV

1. Fragment of a glass bangle, translucent light-green, pentagonal in section. From an early level of Period II. (PRK-1, 525.)

2. Fragment of a glass bangle, opaque, plano-convex in section, bichrome decorated with a thin yellow strip over basal tan. From a mid-level of Period IV. (PRK-1, 26.)

3. Fragment of a glass bangle, opaque, circular in section, bichrome decorated with a pattern consisting of two strips of light-green and deep-blue twined together and fused. From an early level of Period IV. (PRK-1, 77.)

4. Fragment of a glass bangle, opaque, plano-convex in section, polychrome decorated with a pattern consisting of three yellow strips on basal light-green, one each on the sides and the apex, the latter being relieved on top with dots of green and chocolate colour. From the same level as above. (PRK-1, 170.)

5. Fragment of a glass bangle, opaque, plano-convex in section, polychrome decorated with a pattern consisting of three yellow strips on basal black, one each on sides and the apex, the latter being intertwined with chocolate. From a late level of Period IV. (PRK-1, 91.)

6. Fragment of a glass bangle, opaque, plano-convex in section, polychrome decorated with a pattern consisting of yellow lines obliquely running and filled in partly with green and partly with blue ones. From an early level of Period IV. (PRK-1, 77 A.)

7. Fragment of a glass bangle, opaque black in colour, plano-convex in section, deformed in shape at the manufacturing-stage. From an early level of Period IV. (PRK-1, 161.)

8. Fragment of a glass bangle, translucent blue, circular in section. From a mid-level of Period III. (PRK-1, 247.)

9. Fragment of a glass finger-ring, translucent red, circular in section. From a late level of Period III. (PRK-1, 198.)

10. Fragment of a shell bangle, squarish in section. From an early level of Period II. (PRK-1, 524 A.)

11. Fragment of a shell bangle, squarish in section and showing a concavity or saddle due to the structural feature of the conch-shell. From a late level of Period III. (PRK-1, 229.)

12. Fragment of a shell bangle, rectangular in section and showing a roughly circular button in the saddle of the circumference. From a mid-level of Period III. (PRK-1, 211.)

13. Fragment of a shell bangle, double-channelled in section and retaining an oval-shaped button, decorated with incised radial lines. From an early level of Period IV. (PRK-1, 79.)

14. Fragment of a shell bangle, channelled in section. It could have been also used as a bracelet. From a mid-level of Period IV. (PRK-1, 30.)

15. Fragment of a shell bangle, rectangular in section and showing part of a design with a petalled flower. From the latest level of Period IV. (PRK-1, 4.)

16. Fragment of a shell bangle, plano-convex in section and retaining traces of a copper rivet, intended to join it with the other fragment. The design is incomplete and shows only marginal grooves and leaves. From a late level of Period III. (PRK-1, 189 A.)

17. Fragment of a shell bangle, squarish in section and showing a repeated floral pattern. From a mid-level of Period III. (PRK-1, 324.)

18. Fragment of a shell bangle, decorated with bead pattern. From an early level of Period III. (PRK-1, 248.)

19. Fragment of a shell bangle, oblong in section and decorated with a floral pattern. From the latest level of Period IV. (PRK-1, 62.)

20. Fragment of a shell bangle, plano-convex in section and decorated with a floral pattern, also showing a button bearing incised diamonds. From a late level of Period III. (PRK-1, 199.)

21. Fragment of a shell bangle, oblong in section and decorated with file or milled edge pattern. From a late level of Period III. (PRK-1, 137.)

22. Fragment of a shell bangle, squarish in section and decorated with oblique parallel lines to simulate rope-pattern. From a mid-level of Period I. (PRK-1, 558.)

23. Fragment of a shell bangle, oblong in section and decorated with rope-pattern showing twine-effect. From a mid-level of Period III. (PRK-1, 235.)

24. Fragment of a shell bangle, squarish in section and decorated with a pattern showing oscillated lines. From a mid-level of Period II. (PRK-1, 278.)

25. Fragment of a shell bangle, plano-convex in section and decorated with a floral pattern. From a mid-level of Period III. (PRK-1, 253.)

26. Fragment of a shell bangle, squarish in section and decorated with a wavy or twisted pattern. From a mid-level of Period III. (PRK-1, 324 A.)

27. Fragment of a shell bangle, oblong in section and decorated with a segmented pattern formed by transverse grooves enclosing reels. From a mid-level of Period III. (PRK-1, 209D.)

28. Fragment of a shell bangle, rectangular in section and decorated with a floral pattern enclosing a plain segment. From an early level of Period IV. (PRK-1, 300.)

29. Fragment of a shell bangle, squarish in section and decorated with a floral pattern. From an overlapped level of Periods III and IV. (PRK-1, 147.)

30. Fragment of a shell bangle, squarish in section and decorated with segments, one of which bears incised diamond design. From an early level of Period IV. (PRK-1, 128.)

E. Terracotta objects

(i) *Figurines*

The present excavation yielded only six figurines, three each of the human and animal variety. No human figurine was recovered from the deposits of Periods I and II, the available examples being two from Period III (including one from the overlapped levels of Periods III and IV) and one from Period IV. These figurines were produced by the single-mould technique and show a flat back. Of particular interest amongst these is the *aṅkadhātrī*-type mother-and-child figurine (pl. XXV A, *1*) which, in its trefoil coiffure, presence of halo, low relief and plain rigid features recalls the Gupta tradition. Similar figurines have been found from the stratified deposits ascribable to the fourth-seventh century A.D. at Ahichchhatrā, Bhita, Kauśāmbī, Kumrahar, Maheshwar, Nevasa and Ujjain.[1]

[1] V. S. Agrawala, 'Terracotta figurines of Ahichchhatrā, District Bareilly, U. P.', *Ancient India*, no. 4 (1947-48), pp. 146-47, pl. LI B, *183*; J. H. Marshall, 'Excavations at Bhita', *An. Rep. Arch. Surv. Ind., 1911-12* (Calcutta, 1915), pl. XXVIII, *103* and *104;* S. C. Kala, *Terracotta figurines from Kauśāmbī* (Allahabad, 1950), p. 66; A. S. Altekar and Vijayakanta Mishra, *Report on Kumrahar Excavations, 1951-55* (Patna, 1959), p. 115, pl. XLIV, *6*; Sankalia, Subbarao, and Deo, *op. cit.* (1958), fig. 105, *1* and *2*; Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 400; and information from Dr. N. R. Banerjee, respectively.

Of the animal figurines, two came from Period I and one from Period IV. Of these, the bull (pl. XXV B, *5*), painted in black stripes over the entire body, is noteworthy. Painted bulls have been reported from the Harappan and the related assemblages.

Selected examples are listed below.

Pl. XXV

1. Female figurine of a standing mother-and-child, cast from a single mould. While the right hand seems to hang vertically down, the left hand holds the child. The hair is ranged in the characteristic trefoil fashion and the ear-ornaments are seen hanging low on the shoulders. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period III. (PRK-1, 206.)

2. Torso of a female figurine with an attenuated waist. Both the hands seem to be placed akimbo, and around the neck is seen a pearl necklace. Of medium fabric, it is devoid of any surface-treatment. From the overlapped levels of Period III and IV. (PRK-1, 127.)

3. Part of a forearm showing all the five fingers of the hand. Of medium fabric, it is treated with a shining red slip. From an early level of Period IV. (PRK-1, 621.)

4. Head of a bird showing a beak. The eyes are indicated by applied pellets. Hand-modelled. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period IV. (PRK-1, 43.)

5. Fragment of a bull showing forepart of the body with hump and upper part of the forelegs. Of medium fabric, it is treated with a red slip and painted over with black stripes. From an early level of Period I. (PRK-1, 622.)

(ii) *Other objects*

Other terracotta objects recovered from the excavation include: toy cart-wheels; stoppers; spools; dabbers; marbles; rings; a feeder-like object; flesh-rubbers; head-scratchers (?); and sharpeners (?). Of these, the last two deserve special mention. The object regarded as head-scratcher (pl. XXVI A, *11*), on the analogy of the cut mango-stone used in the villages of the Deccan,[1] consists of a boat-shaped hollow, semi-circular or parabolic in outline and sometimes having a hole at the vertex. Examples of compartmented hollows, in the N.B.P. Ware fabric, are also known from sites in the Ganga plains. The type is fairly wide-spread,[2] being found principally at Nasik, Maheshwar, Kauśāmbī, Rupar, Nagda and Ujjain, and is often associated with the Northern Black Polished Ware assemblage. The 'sharpeners' or hones are in fact potsherds smooth-ground along their periphery to either oval, rectangular or triangular shape. The exact purpose for which these potsherds were used is, however, not known. They are surmised to be sharpeners for copper tools.[3] Apart from Nevasa similar objects have been reported from the chalcolithic levels at Bahal and Daimabad.[4] It may be of interest to note that a roughly similar piece was also obtained, though from a chronologically disparate horizon, from Carchemish along with some of the pottery-forms paralleled at Navdatoli, viz. the bowl, painted all over with small circles.[5]

The selected examples are listed below.

[1] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 199.

[2] Sankalia and Deo, *op. cit.* (1955), pp. 101 and 102, fig. 48, *5-8*, and pl. XXIII, *1-3* and *5*; Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 199.

[3] Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), pp. 381–83, fig. 175, *1-3*.

[4] Information from Shri M. N. Deshpande.

[5] Leonard Woolley, 'The prehistoric pottery of Carchemish', *Iraq*, 1 (1934), pls. XIX*a* and XXI*b*, *5*.

Pl. XXVI

1. Toy cart-wheel of red ware. The spokes and the hub are indicated by black-painted lines. The painted side is slightly convex, while the underside (unpainted) is almost flat but shows a burred edge at the centre in the shape of a hub. Of medium fabric, it is treated with a thin self-slip and painted over with black stripes. From a mid-level of Period I. (PRK-1, 437.)[1]

2. Toy wheel of red ware. The hubs on either side are projected. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period IV. (PRK-1, 19.)

3. Annular ring of red ware. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period II. (PRK-1, 465.)

4. Marble of red ware. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period III. (PRK-1, 243.)

5. Cylindrical solid. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period II. (PRK-1, 280.)

6. Fragment, possibly of a casket, decorated with deep grooves. Of fine fabric, it is treated with a black slip. From an early level of Period II. Also fig. 26, *47*. (PRK-1, 502.)

7. Fragment, possibly of a casket, decorated with bands of excised triangles. Of fine fabric, it is treated with a self-slip. From an early level of Period II. (PRK-1, 488.)

8. Sherd of red ware, ground-smooth along the edges to a circular shape and perforated at the centre. The sides of the perforation are smoothened due to use. Of fine fabric, it is treated with a red slip and painted over in black with criss-cross design. From a late level of Period IV. The fabric of the sherd, however, closely resembles the black-painted red wares of the chalcolithic assemblage of Period I. In Period IV, this sherd was presumably picked from an earlier horizon. (PRK-1, 33.)

9. Feeder-like object of dull-red ware. Of coarse fabric, it is devoid of any surface-treatment. From an overlapped level of Periods II and III. (PRK-1, 315.)

10. Spool of red ware. Of medium fabric, it is devoid of any surface-treatment. From an early level of Period II. (PRK-1, 571.)

11. Head-scratcher of red ware. Of fine fabric, it is devoid of any surface-treatment. From a mid-level of Period II. (PRK-1, 623.)

12. Flesh-rubber of red ware. Of coarse fabric, it is devoid of any surface-treatment. From a late level of Period III. (PRK-1, 212.)

13. Anvil-like object of dull-red ware. The central part on the flat side shows smoothened depression. Of coarse fabric, it is devoid of any surface-treatment. From an unstratified deposit. (PRK-1, 627.)

14. Upper part of a stopper or a knob of dull-grey ware. Of medium fabric, it is treated with a slip on the top part. From a late level of Period I. (PRK-1, 624.)

15. Stopper of red ware. The outer surface is decorated with applied knobs enclosed within vertical bands. Of medium fabric, it is devoid of any surface-treatment. From a late level of Period IV. (PRK-1, 25.)

16. Dabber of dull-grey ware. Of coarse fabric, it is devoid of any surface-treatment. From an early level of Period III. (PRK-1, 241.)

17. Object of indeterminate use, consisting of a disc with cut-out leaf-shaped apertures (possibly a stamp for floral arrangement). Of fine fabric, it is treated on the outer periphery with a chocolate polished slip. From an overlapped level of Periods II and III. (PRK-1, 625.)

18. Oval-shaped potsherd of indeterminate use with edges ground smooth (possibly hones). Of medium fabric, it is devoid of any surface-treatment. From a mid-level of Period I. (PRK-1, 570.)

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[1] For comparison, see Sankalia, Subbarao and Deo, *op. cit.* (1958), pp. 192-98.

19. Triangular potsherd similar to *18* above. From a mid-level of Period I. (PRK-1, 572.)

F. Metal objects

(i) *Copper*

The excavation yielded fortythree copper objects including shapeless or indeterminate bits. They were recovered as follows: Period I, one; Period II, twentyone; Period III, fourteen; Period IV, six; and unstratified, one. These include eight antimony-rods (fig. 39, *1-3*; pl. XXVII A, *2* and *3*) from Periods II-IV; two pins (fig. 39, *4*; pl. XXVII A, *1*), one each from Periods II and III; four bangles (fig. 39, *5* and *6*; pl. XXVII A, *6*), from Periods II and III; three bells (fig. 39, *7-9*; pl. XXVII A, *7* and *8*), from Periods II and III; three rings (fig. 39, *11* and *12*; pl. XXVII A, *4* and *5*), from Periods II and IV; and three stoppers, one each from Periods II to IV. Amongst other objects, rim-fragments of a miniature bowl and an open-mouthed channel-tube (fig. 39; *13*), both from Period II, claim attention. The remaining examples, including a solitary bit from Period I (unillustrated), are shapeless. The rarity of the copper objects in Period I emphasizes the economy of the early settlers to whom copper or bronze seemed to be a very precious and prized metal.

From the chemical analysis and metallographic examination of the illustrated samples (below, pp. 131-35), it is seen that none of the specimens examined was cast and that smelting-process was not perfect. The presence of sulphide in some of the objects would lead us to infer that copper sulphide was perhaps the raw material used for making these objects. Furthermore, some of the objects, after analysis (below, pp. 133-35), are found to be of bronze (fig. 39, *3*, *9* and *13*), leaded bronze (fig. 39, *6*, *7* and *8*), leaded brass (fig. 39, *5*) and brass (fig. 39, *11*).

Reference to the illustrated objects in pl. XXVII A is indicated against the corresponding drawn nos. *1*, *3* to *5*, *8*, *9*, *11* and *12* of fig. 39.

The selected examples are listed below.

Fig. 39; pl. XXVII A

1. Antimony-rod of a round section. From a late level of Period II. Also pl. XXVII A, *3*. (PRK-1, 308.)

2. Antimony-rod of a round section, showing a folded lower end slenderer than the preceding example. From an early level of Period III. (PRK-1, 434.)

3. Antimony-rod of a round section. From an early level of Period IV. Also pl. XXVII A, *2*. (PRK-1, 169.)

4. Pin of a round section, tapering to a point. From a late level of Period III. Also pl. XXVII A, *1*. (PRK-1, 124.)

5. Fragmentary bangle of a round section. From the same deposit as above. Also pl. XXVII A, *6*. (PRK-1, 197.)

6. Fragmentary bangle of an elliptical section. From an early level of Period II. (PRK-1, 371.)

7. Lid with a ring-handle, or hollow body of a bell. From an overlapped level of Periods II and III. (PRK-1, 316.)

8. Bell with a four-sided hollow body, a constriction below the terminal ring and a grooved thickened rim-base; the tongue-part is missing. From an early level of Period III. Also pl. XXVII A, *8*. (PRK-1, 321.)

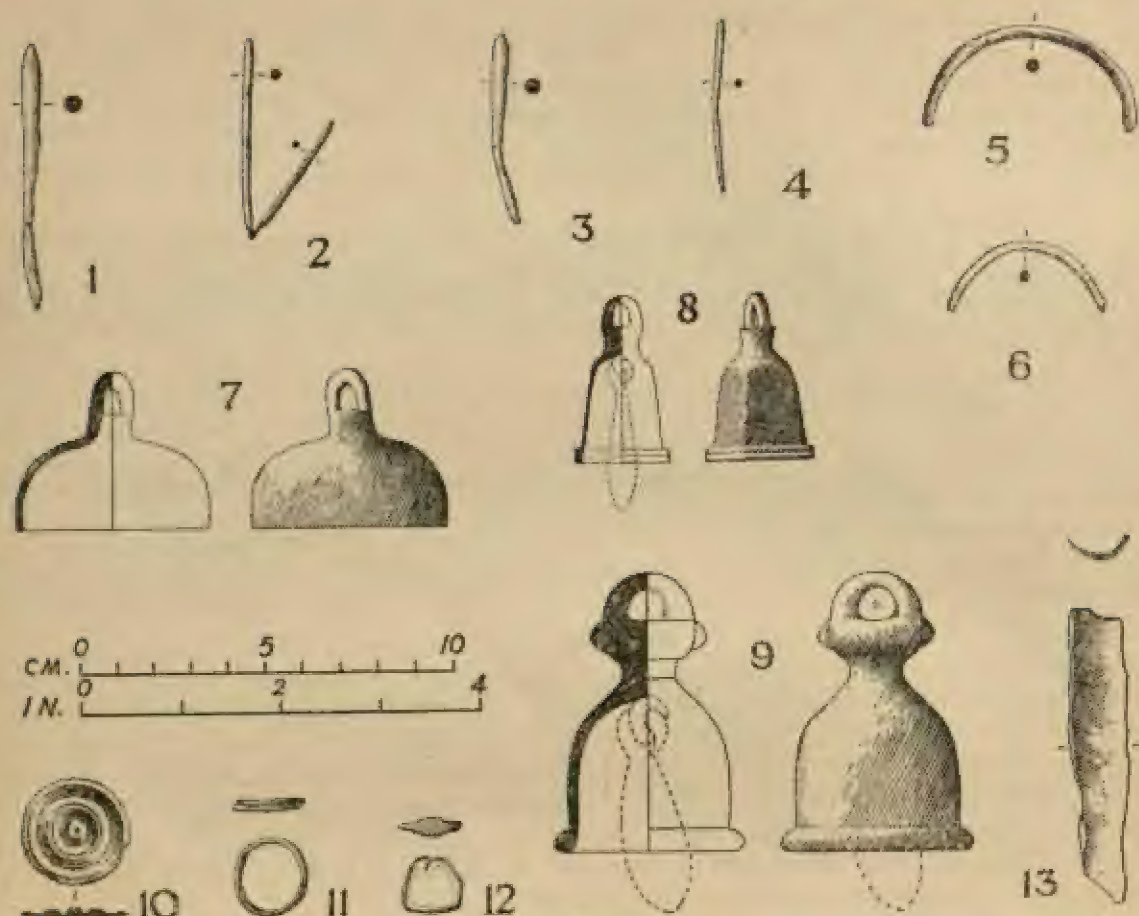


FIG. 39. *Copper objects*

9. Bell with a cup-shaped hollow body, a bold rim below the terminal ring and a round collared rim-base. From a mid-level of Period III. Also pl. XXVII A, *7.* (PRK-1, 439.)

10. Upper-part of a stopper or part of an ear-ornament, decorated with concentric ribs. From an early level of Period III. (PRK-1, 269.)

11. Ring (coil-like) of a round section with overlapped ends. From the top deposit of Period II, overlapped with Period III. Also pl. XXVII A, *4.* (PRK-1, 293.)

12. Ring of a flattish section containing the bezel-part and with overlapping ends. From the same level as above. Also pl. XXVII A, *5.* (PRK-1, 293 A.)

13. Fragmentary channel-tube of indeterminate use. From an early level of Period II. (PRK-1, 405.)

(ii) *Iron*

The number of iron objects recovered from the excavation totals only eightyseven. distributed as follows: Period II, thirty; Period III, twentyone; and Period IV, thirtysix, The occurrence of iron objects in Period II has some bearing on the problem of the antiquity of iron in India (see above, pp. 22 and 23) and as such deserves added attention. The occupation-deposit of Period II, comprising layers 44 B to 33, represents an average thickness of 17½ ft. of which the upper 2 ft. or so is overlapped with the early levels of Period

III (pl. V). Layer 34 in the overlapped strata as also the two layers immediately preceding it, viz. 36 and 37, yielded *inter alia* sherds of the Northern Black Polished Ware. A few pottery-types, normally associated with this Ware (figs. 23, *1a* and fig. 26, *40* and *41*), were, however, also found a little lower down. Of the thirty objects recovered from Period II, as many as twentyfour came from the deposits prior to the emergence of the N.B.P. Ware. On this showing, the use of iron prior to the appearance of the N.B.P. Ware at the site is clearly indicated.[1] The foregoing evidence is consistent with the findings at Hastināpura, Rupar, Maheshwar[2] and more recently at Alamgirpur,[3] Nagda, Ujjain,[4] Kauśāmbī,[5] Atranjikhera and Ahichchhatrā. Notable shapes from the lower deposits of Period II include: tanged arrow-head (fig. 41, *12*; pl. XXVIII A, *2*); celt-like axe-head (fig. 41, *14*; pl. XXVIII A, *9*); knife-blade (fig. 41, *11*; pl. XXVIII A, *8*); sickle (fig. 41, *15*); chisel-ended tanged object, possibly a carpenter's tool (fig. 40, *4*; pl. XXVIII A, *1*); lance- or spear-head (fig. 41, *16*; pl. XXVIII A, *3*); and a ferrule (fig. 40, *6*; pl. XXVIII A, *7*), besides the ubiquitous nail (fig. 40, *9*). From the upper 6 to 7 ft. of deposit only a clamp (fig. 40, *3*; pl. XXVIII A, *4*) and a rod of indeterminate use (fig. 40, *1*) need mention.

Objects of particular interest from Periods III and IV include: shaft-hole axe (fig. 43, *29* and *30*; pl. XXVIII B, *14*); punch (fig. 42, *20*; pl. XXVIII B, *12*); socketed knife-blade (fig. 42, *28*; pl. XXVIII B, *15*); and a bobbin-like object (fig. 43, *31*; pl. XXVIII B, *19*).

From the chemical analysis of some of the objects (below, pp. 135-39) it is seen that the implements were originally made of iron metal which later completely oxidized.

Reference to the illustrated objects on pl. XXVIII is indicated against the corresponding drawn nos. *2* to *7*, *11*, *12*, *14*, *16*, *17*, *20*, *22*, *23*, *26* to *29* and *31* of figs. 40 to 43.

Selected objects are listed below.

FIGS. 40 to 43; pl. XXVIII

1. Rod of a round section, tapering to the bottom. From a late level of Period II. (PRK-1, 479.)

2. Rod of a round section, pointed at the lower end. From an early level of Period II. Also pl. XXVIII A, *10*. (PRK-1, 496.)

3. Clamp. From a late level of Period II. Also pl. XXVIII A, *4*. (PRK-1, 329.)

4. Chisel-ended tanged object, possibly a carpenter's tool. Roughly similar objects, but of larger size, have been recovered from Taxila, where their occurrence is assigned to a range of *circa* fourth century B.C.[6] to first century A.D. From an early level of Period II. Also pl. XXVIII A, *1*. (PRK-1, 365.)

5. Ring-head of an indeterminate object, possibly a spike or chisel. From an early level of Period II. Also pl. XXVIII A, *5*. (PRK-1, 508.)

6. Ferrule. From an early level of Period II. Also pl. XXVIII A, *7*. (PRK-1, 337.)

7. Ring, possibly used for binding. From an early level of Period II. Also pl. XXVIII A, *6*. (PRK-1, 509.)

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[1] For the date of the N.B.P. Ware at the site, see above, p. 74.

[2] Sankalia, Subbarao and Deo, *op. cit.* (1958), p. 211.

[3] *Indian Archaeology 1958-59*, p. 54.

[4] *Ibid.*, p. 195.

[5] *Ibid.*, p. 47.

[6] John Marshall, *Taxila*, II (Cambridge, 1951), p. 553; III, pl. 166, *112* and *113*.

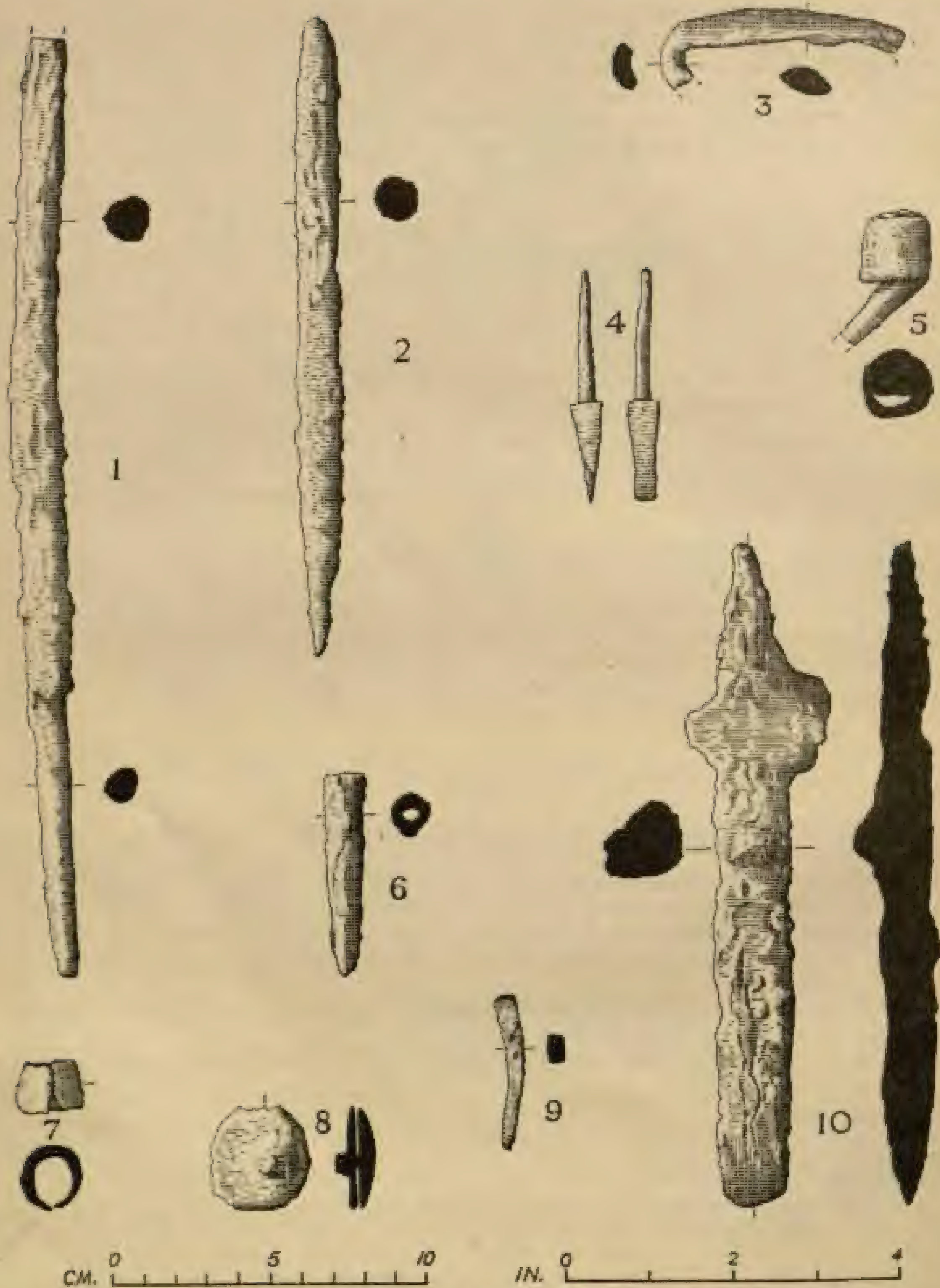


FIG. 40. *Iron objects*

8. Nail-head or stopper. From the overlapped strata of Periods II and III. (PRK-1, 304.)

9. Nail of an oblong section, tapering towards the lower end. From an early level of Period II. (PRK-1, 364.)

10. Object of indeterminate use with a chisel end at the lower end and a tang rising from an expanded part at the upper end, possibly for hafting. From an early level of Period II. (PRK-1, 506.)

11. Knife-blade. From an early level of Period II. Also pl. XXVIII A, *8.* (PRK-1, 489.) Similar knife-blades have been found at Nasik[1] and Nevasa[2] from the strata ascribable to *circa* fourth-second century B.C.

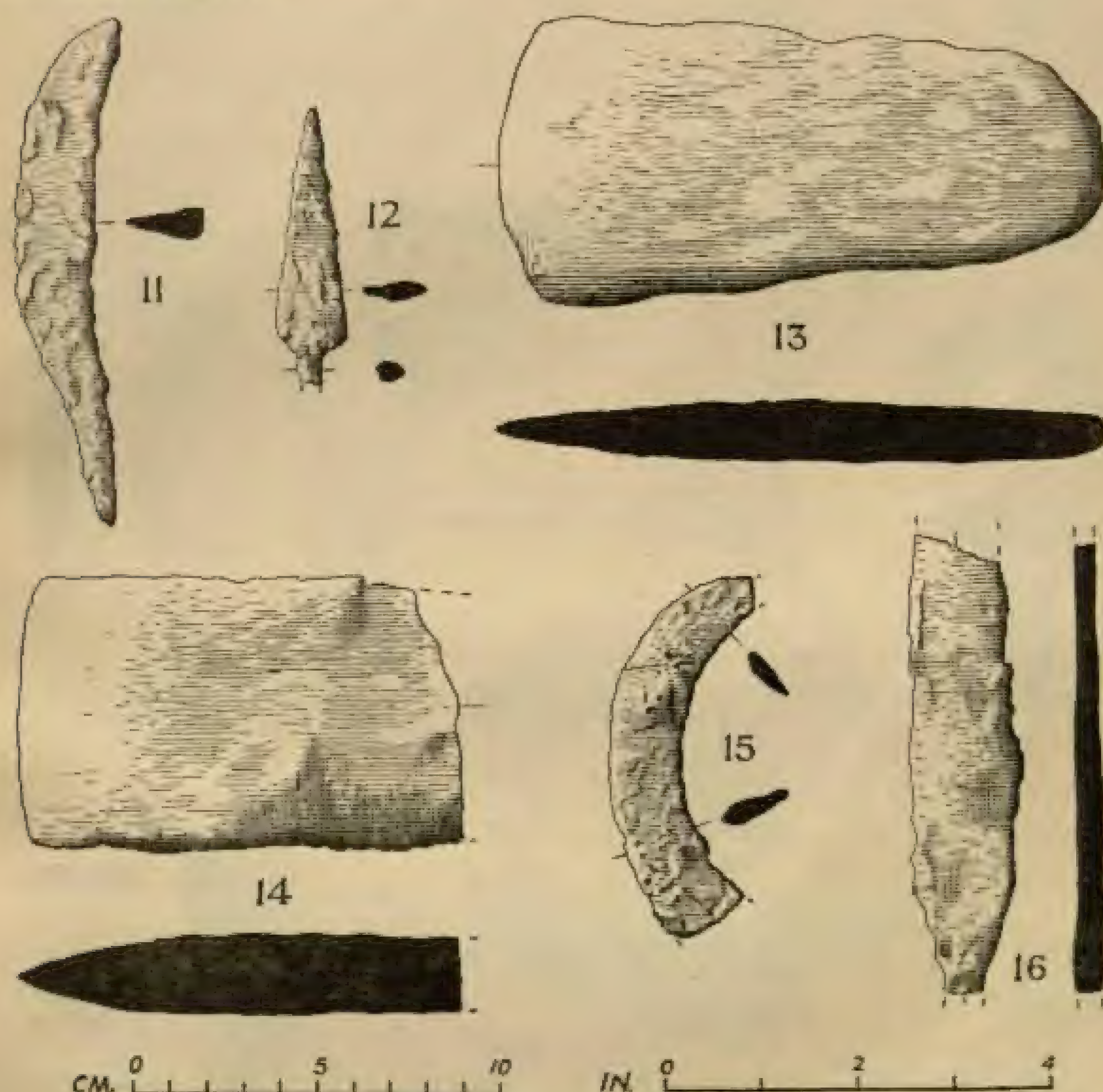


Fig. 41. *Iron objects*

[1] Sankalia and Deo, *op. cit* (1955), p. 113, pl. XXVII, *4* and *5*.

[2] Sankalia, Deo, Ansari and Ehrhardt, *op. cit.* (1960), p. 425, fig. 188, *8*.

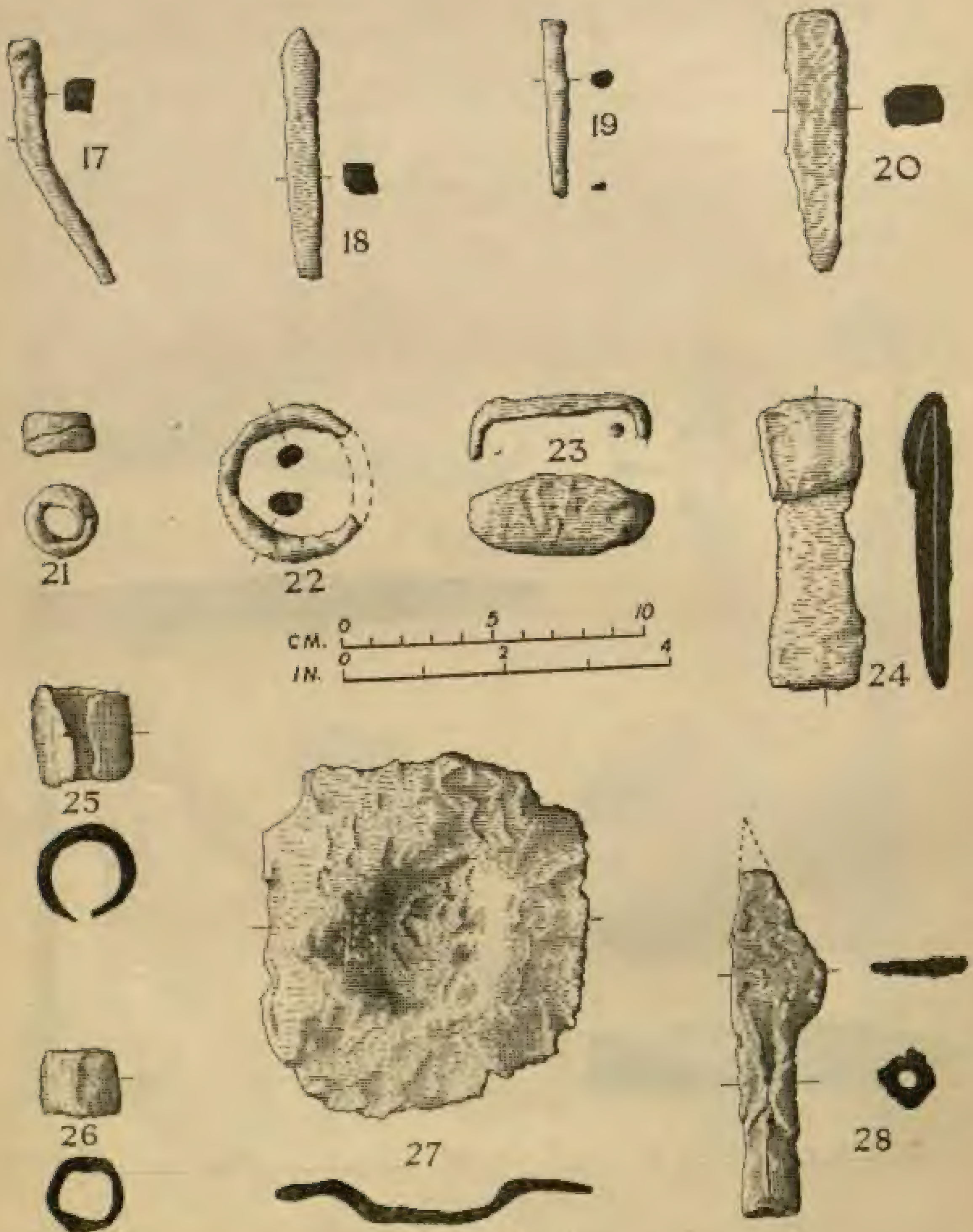


FIG. 42. *Iron objects*

12. Arrow-head with a broken tang. From an early level of Period II. Also pl. XXVIII A, *2.* (PRK-1, 507.)

13. Celt-like axe-head. From a mid-level of Period II. (PRK-1, 504 A.)

14. Celt-like axe-head. From a mid-level of Period II. Also pl. XXVIII A, *9.* (PRK-1, 387.) Similar celts have been found also at Nagda and Ujjain in strata of comparable period.

15. Sickle-fragment. From an early level of Period II. (PRK-1, 512.)

16. Lance-or spear-head. Both the tang and the upper part are broken. From the same level as above. Also pl. XXVIII A, *3.* (PRK-1, 370.)

17. Nail, bent, of a squarish section. From surface-collection. Also pl. XXVIII B, *11* (PRK-1, 626.)

18. Nail of a squarish section with broken top. From a late level of Period IV. (PRK-1, 6.)

19. Nail of a round section. From a late level of Period IV. (PRK-1, 68.)

20. Punch with the broken lower tip. From an overlapped level of Periods III and IV. Also pl. XXVIII B, *12.* (PRK-1, 131 A.)

21. Coiled ring. From a late level of Period IV. (PRK-1, 13.)

22. Bangle. From an early level of Period III. Also pl. XXVIII B, *17.* (PRK-1, 215.)

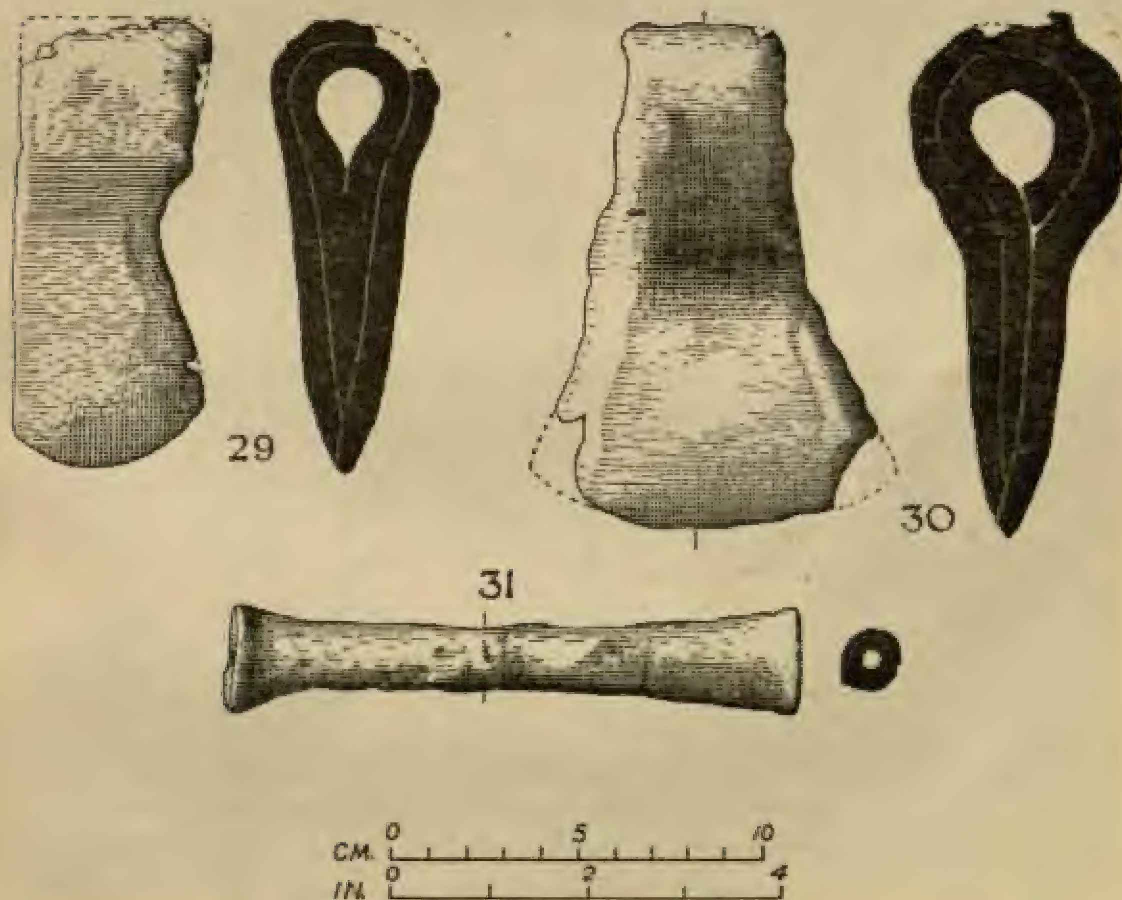


FIG. 43. *Iron objects*

23. Clamp. From a late level of Period IV. Also pl. XXVIII B, *16.* (PRK-1, 36.)

24. Object of indeterminate use, folded at the top. From a mid-level of Period III. (PRK-1, 237.)

25. Ring-fastener with open ends. From a late level of Period IV. (PRK-1, 7.)

26. Ring-fastener with joined ends. From an early level of Period IV. Also pl. XXVIII B, *18.* (PRK-1, 185.)

27. Dish with horizontally-splayed lip. From a mid-level of Period IV. Also pl. XXVIII B, *13.* (PRK-1, 37.)

28. Chopper or knife-blade with socketed lower part. From an early level of Period III. Also pl. XXVIII B, *15.* (PRK-1, 259.)

29. Shaft-hole axe. From a mid-level of Period IV. Also pl. XXVIII B, *14.* (PRK-1, 44.)

30. Shaft-hole axe with a splayed cutting-edge. From an early level of Period III. (PRK-1, 305.)

31. Bobbin-like object with a central perforation. From a mid-level of Period III. Also pl. XXVIII B, *19.* (PRK-1, 384.)

(iii) *Lead*

Only two lead objects, apart from a doubtful piece of coin, were obtained from the present excavation. Each of these came from a different level of Period III but basically belongs to the same type, viz. the spool, possibly used for distending the ear-lobe. The practice of distending the ear-lobe is still continued in south India by the lower castes.[1] A roughly similar example was also obtained at Sisupalgarh.[2]

The specimens are listed below.

Fig. 44; pl. XXVII B

1. Spool of coiled strip. From a mid-level of Period III. (PRK-1, 252.)

2. Coiled strip. For the preparation of the spool, this strip is hammered to a channelled section and closely wound. From an early level of Period III. (PRK-1, 295.)



Fig. 44. *Lead objects*

G. Miscellaneous objects of bone, ivory and semi-precious stone

Under this class of finds are included: bone styluses; awls or borers, variously from Periods I, II and III; a unique perfume-casket of bone, from Period II; an ivory comb,

[1] Edgar Thurston, *Castes and Tribes of Southern India* (Madras, 1909).

[2] B. B. Lal, 'Śiśupālgarh 1948: an early historical fort in eastern India', *Ancient India*, no. 5 (1949), pp. 89-91, pl. XLVII, *12.*



Beads: 1, 18, 27 to 29, 31 to 33 and 35, Period I; 2, 7, 10, 14, 15, 22 to 24, 26 and 30, Period II; 8, 11, 21, 25, 34, and 36, Period III; 3 to 6, 9, 12, 13, 16, 17, 19 and 20, Period IV. See pp. 112-15

To face p. 128



A. *Terracotta beads and pendant: 37 to 40, Period III; 41, Period II; 42, Period IV.* *See p. 115*



B. *Glass bangles: 1, Period II; 2 to 7, Period IV; 8* and *9, Period III.* *See p. 117*

To face pl. XXIV



Shell bangles: 10 and 24, Period II; 11, 12, 16 to 18, 20, 21, 23, 25 to 27 and 29, Period III; 13 to 15, 19, 28 and 30, Period IV; 22, Period I. See pp. 117-18

To face pl. XXIII



A. *Terracotta human figurines: 1 and 2, Period III; 3, Period IV.* *See p. 119*



B. *Terracotta bird and animal figurines: 4, Period IV; 5, Period I.* *See p. 119*



A. *Terracotta objects: 1, Period I; 3, 5 to 7 and 9 to 11, Period II; 4, Period III; 2 and 8, Period IV. See p. 120*



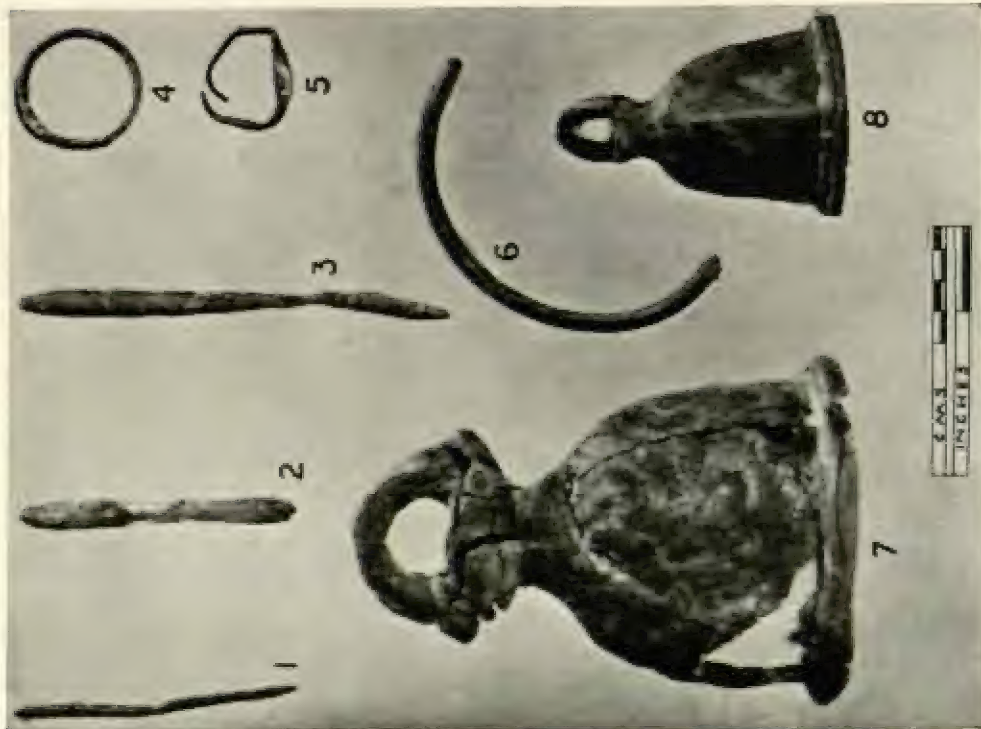
B. *Terracotta objects: 12 and 16, Period III; 14, 18 and 19, Period I; 17, Period II; 15, Period IV; 13, unstratified. See pp. 120-21*



B. *Lead objects, Period III. See p. 128*



C. *Coins: 1 to 3, Period III; 4, Period IV. See p. 130*



A. *Copper objects: 1, 6, 7 and 8, Period III; 2, Period IV; 3 to 5, Period II. See pp. 121 and 122*



A. *Iron objects, Period II. See pp. 125-127*



B. *Iron objects; 11, surface; 12, 15, 17 and 19, Period III; 13, 14, 16 and 18, Period IV. See pp. 127-128*



Miscellaneous objects of bone, ivory and semi-precious stone: 1, 2, 4 and 6 to 10, Period II; 3, Period I; 5, Period III. *See p. 129*

from the overlapped levels of Periods II and III; a carnelian stick with a square section, from Period II; and the well-known pulley-shaped ear-ornaments made of jasper, glass or crystal, black jasper accounting for as many as five out of a total yield of eight, the remaining three being one each of red jasper, crystal and glass. Excepting a discountable fragmentary example from Period IV and one unstratified example, all the specimens came from Period II. Similar ear-ornaments of like material are also known at other historical sites like Hastināpura, Kaundanpur and Ujjain. Although the lowest specimen from Hastināpura occurs in association with the Painted Grey Ware, the central date for their use, as at Prakash, falls within the range of *circa* sixth-second century B.C.

The selected specimens are listed below.

Pl. XXIX

1. Bone: stylus showing the carved top and a uniformly-polished surface. From a mid-level of Period II. (PRK-1, 456.)

2. Bone: stylus with the upper end broken. The working-edge seems to have been made by chipping, of which the marks are clearly visible. From the earliest level of Period II. (PRK-1, 379.)

3. Bone: stylus with the upper end broken. Traces of chipping are prominently seen, partly polished. From the latest level of Period I, being one of the two examples from this Period. (PRK-1, 377.)

4. Bone: borer, the working-point has been obtained by chipping and grinding. From a late level of Period II. (PRK-1, 254.)

5. Bone: awl with a fine working-point, and showing polished surface. From an early level of Period III. (PRK-1, 444.)

6. Bone: perfume-casket with a delicately-worked stopper. The bone marrow has been very carefully scooped out to make this casket. The exterior surface is polished. Similar caskets in metal are reported from Ujjain.[1] From a mid-level of Period II. (PRK-1, 457.)

7. Ivory: comb. From an overlapped level of Periods II and III. (PRK-1, 196.)

8. Carnelian: stick of indeterminate use, showing a square section. From the earliest deposit of Period II. (PRK-1, 517.)

9. Jasper, red: pulley-shaped ear-ornament. From a mid-level of Period II. (PRK-1, 272.)

10. Crystal: pulley-shaped ear-ornament. From the same level as above. (PRK-1, 464.)

H. Coins

The present excavation yielded only eight coins,[2] six of copper and one each of lead and bronze (?), distributed as follows: Period II, two; Period III, three and Period IV, three. Out of these, the solitary lead and two copper coins were fragmentary and badly damaged for any clear attribution. Of the remaining five, only four, all the available three from Period III and one from Period IV, are illustrated here. The two coins from Period II, both from the late levels, are of the rectangular punch-marked variety. One of them was fragmentary, while the other, though badly corroded and not permitting clear illustration, shows on the obverse part of a solar symbol above the broken corner and possibly a six-pronged symbol within a circle at the other end, the reverse being blurred. Unfortunately, their evidential value is rather vague. The occurrence of the punch-marked

[1] Information from Dr. N. R. Banerjee.

[2] A surface-collection of coins from this site has been published by H. V. Trivedi, ' Some new ancient Indian coins ', *Journal of the Numismatic Society of India*, XXII, pt. II (1955), pp. 33-38.

coins, however, in this Period, which also yielded the N.B.P. Ware, is consistent with the already familiar findings from other sites in Yamuna-Ganga plains as also from Maheshwar and Bahal in central and western India.

Of the three coins from Period III, two (pl. XXVII C, *1* and *3*) came from the early and one (pl. XXVII C, *2*) from the top levels. The former, being tribal Ujjayinī, are ascribable to *circa* first century B.C., while the attribution of the latter is rather doubtful. On general grounds and conversely on the basis of a terracotta figurine of *aṅkadhātrī* type (above, pp. 118 and 119), occurring in a preceding layer, it may be assignable to about the end of the sixth century A.D. This accords well also with the ceramic evidence.

The three coins from Period IV were one each respectively from the lower, middle and late levels. Of these, the former two were damaged and corroded. The illustrated specimen (pl. XXVII C, *4*), although dated to the beginning of the Christian era[1], was found out of chronological context in the top deposits of the site, and as such affords no dating value to the associated strata.

These coins have been kindly identified by Dr. D. C. Sircar, formerly Government Epigraphist, whose report is as below.

Pl. XXVII C

1. *Obv.:* what looks like a six-pronged symbol, a standard with a taurine-capital and part of a human figure, respectively from left to right; *rev.: svastika* with taurines at each end. *Metal:* copper; *size:* 1·5 × 1·1 cm.; *weight:* 2·6286 grams; *shape:* almost square; *condition:* fair. Cf. Allan, *Catalogue of the Indian Coins in the British Museum, Coins of Ancient India* (London, 1936), p. 254, *85*, and Cunningham, *Coins of Ancient India*, p. 98; pl. X, *11*. From an early level of Period III. (PRK-1, 454.)

2. *Obv.:* within a circle with pellets around, lion with tail downward (?) to right; *rev.:* within a broad circle of radiating lines, vase (on a stand) between two tall trifid lamp-stands or standards. *Metal:* copper; *size:* 1·6 cm.; *weight:* 4·9336 grams; *shape:* round; *condition:* good. Elliot attributes such coins to the Pallavas but the attribution is doubtful. Cf. W. Elliot, *Coins of Southern India* (London, 1885), p. 152 B, pl. II, *50*. From a late level of Period III, overlapped with Period IV. (PRK-1, 132.)

3. *Obv.:* an indeterminate symbol, a standard with a taurine-capital and possibly a human figure, respectively from left to right; *rev.: svastika* with taurines at each end. *Metal:* bronze (?); *size:* 1·5 × 1·1 cm.; *weight:* 3·0646 grams; *shape:* rectangular; *condition:* fair. The coin-flan is too small for date, greater part of the impression being off the flan. Cf. Cunningham, *Coins of Ancient India*, p. 98, pl. X, *11*. From the same level as 1 above. (PRK-1, 218.)

4. *Obv.:* defaced; *rev.:* what looks like an extended hand on the left. *Metal:* copper; *size:* 2 × 2·1 cm.; *weight:* 7·5000 grams; *shape:* almost square; *condition:* fair. Cf. Triton holding dolphin and rudder and the extended right-hand of Zeus holding callipers on the square copper coin, illustrated by Whitehead, *Catalogue of the Coins in the Punjab Museum, Lahore*, p. 77, pl. VIII, *631* and p. 144, pl. XIV, *397*, and attributed to Hippostratos and Spalirises. From the top level of Period IV. (PRK-1, 120.)

[1] A. K. Narain, *The Indo-Greeks* (Oxford, 1957), pp. 162 and 163.

8. CHEMICAL ANALYSIS AND METALLOGRAPHIC EXAMINATION OF METAL OBJECTS[1]

By Dr. V. T. Athavale

A. Copper objects

(i) *Chemical analysis*

Of the thirteen samples illustrated in the report (above, pp. 121 and 122), samples *4* and *12*, being too small, were not analysed, and *10* was not sent to the Laboratory. The condition of the samples was as below:

1. The sample was much corroded and pitted. Bluish-green deposits on surface could not be completely removed by sand-paper.

2. The sample was corroded with brownish-green deposits. This could be rubbed out to get a clean metal-surface.

3. The sample was slightly corroded and could be cleaned with a sand-paper to show a clean metal.

4. Not analysed.

5. Sample slightly corroded. On rubbing with sand-paper, shining brass-colour was visible.

6. The sample had a deposit of light-blue salts and a thick film of oxide which was difficult to remove with sand-paper. For analysis, this deposit was removed as far as possible.

7. Deposits of greenish-blue salts were spread over the whole sample. The sample appeared to be in a much oxidized state and had become much brittle to the extent that it could be powdered.

8. Surface-corrosion was comparatively less. On slight rubbing with sand-paper, shining bronze-colour was visible.

9. The sample was highly oxidized with several cracks and had the appearance of a crude casting.

10. Not received.

11. The sample appeared slightly corroded, with thin brown oxide-film. On slight rubbing with sand-paper, shining brass-colour was visible.

12. Not analysed. The brown oxide-film on surface could be removed by rubbing with sand-paper. The cleaned surface had a metallic copper-colour.

13. The sample appeared to be completely corroded with no metallic part. It was very brittle to the extent that it could be easily powdered.

The analysis of the ten samples is given in the appended Table VI.

(ii) *Metallographic examination*

Metallographic investigation was carried out on objects *1*, *4*, *5*, *6* and *11* only. Objects *7*, *8*, *9* and *13*, being highly oxidized, were not found good for any structure-studies.

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[1] Thanks are due to Smt. L. Thomas, Dr. M. D. Karkhanavala and Shri C. H. Rambabu for supplying data on metallographic X-ray and microscopic analysis and to Shri S. V. Gulvane and Dr. M. Sundaresan for chemical analysis.

The metallographic investigation was carried out on the transverse sections of the specimens. Additional information could have been gathered by the examination of the longitudinal section. This was not done so that the destruction of the specimen could be kept to a minimum.

TABLE VI

CHEMICAL ANALYSIS OF COPPER OBJECTS

Constituents \ Lab. no. / Object no.	1774 *1*	1775 *2*	1776 *3*	1778 *5*	1779 *6*	1780 *7*	1781 *8*	1782 *9*	1784 *11*	1786 *13*
	%	%	%	%	%	%	%	%	%	%
Sn	Nil	Nil	1·48	Nil	9·10	19·43	20·23	18·97	Nil	4·22
*Sb	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Pb	2·21	Nil	1·23	8·34	1·49	5·87	3·48	Nil	Nil	Nil
*As	Nil	Nil	Nil	Nil	Trace	Trace	Trace	Trace	Trace	Nil
Cu	95·12	98·48	95·85	63·50	85·14	61·32	66·10	58·82	77·88	66·56
Ni	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Zn	Nil	Nil	Nil	25·86	Nil	Nil	Nil	Nil	17·75	Nil
TOTAL	97·33	98·48	98·56	97·70	95·73	86·62	89·81	77·79	95·63	70·78
SiO_2	N.D.	N.D.	N.D.	N.D.	N.D.	1·65	N.D.	0·71	N.D.	2·41
$Fe_2O_3+Al_2O_3$	N.D.	N.D.	N.D.	1·17	N.D.	1·04	N.D.	0·59	1·70	3·93
Mn, Cr. oxides	N.D.	N.D.	N.D.	N.D.	N.D.	Nil	Nil	Nil	N.D.	Nil
CaO, MgO	N.D.	N.D.	N.D.	N.D.	N.D.	Trace	Nil	Nil	N.D.	Nil
Sulphides expressed as S	N.D.	N.D.	N.D.	N.D.	N.D.	0·32	N.D.	0·16	N.D.	1·22
Sulphate expressed as SO_4	N.D.	N.D.	N.D.	N.D.	N.D.	Nil	N.D.	Nil	N.D.	0·43
TOTAL	97·33	98·48	98·56	98·87	95·73	89·63	89·81	79·25	97·33	78·77
H_2O	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	4·77	N.D.	9·07
Oxygen (corrected for sulphide)	N.D.	N.D.	N.D.	N.D.	N.D.	8·50	6·5	13·54	N.D.	3·29
Loss or gain on ignition	N.D.	N.D.	N.D.	N.D.	N.D.	+7·67	N.D.	−1·82	N.D.	−6·89

*Spectrographic analysis; N.D. = Not determined; + Gain in weight on ignition; − Loss in weight on ignition.

The specimens were examined in the unetched and etched condition at low and high magnifications and the observations made are recorded below in respect of each such sample. The etchant used was of the following composition: chromium trioxide, 12·5 g.; hydrochloric acid, 1 ml.; H_2SO_4, 1 ml.; teepol, 1 ml.; and water, 500 ml.

Wherever necessary other etchants were used to verify the results obtained.

The observations made on the photomicrographs of the above five samples are as follows. None of the specimens examined is cast and appears to be homogeneous good alloy.

Pl. XXX

1. Copper object no. *1:* transverse section in the as polished condition showing evidence of intergranular corrosion at edge of specimen and distribution of lead-particles (× 12).

2. Copper object no. *1:* transverse section in the as polished condition showing random distribution of five lead-particles (× 120).

3. Copper object no. *1:* transverse section in the etched condition showing twinned recrystallized grains and random distribution of black lead-particles (× 120).

Pl. XXXI

1. Copper object no *4:* transverse section in the unetched condition showing uniform distribution of inclusion (× 120).

2. Copper object no. *4:* transverse section in the etched condition showing wrought structure, random distribution of inclusion with respect to grain, directionality indicated by inclusion and bent twins and strain lines indicating a recrystallized structure which has undergone further cold work (× 340).

3. Copper object no. *5:* transverse section in the unetched condition showing fine uniformly-distributed lead-particles, large non-uniform distribution of particles indicating direction of working and lack of intergranular corrosion (× 12).

4. Copper object no. *5:* transverse section in the etched condition showing recrystallized structure, single-phase copper-based alloy, random distribution of both fine and coarse inclusions and evidence of further cold working after recrystallization (× 120).

Pl. XXXII

1. Copper object no. *6:* transverse section in the unetched condition (edge of specimen) showing lead-particles which were not corroded in the dark-grey area, intergranular corrosion and grain-boundary and twins in the corroded area (× 675).

2. Copper object no. *6:* transverse section in the unetched condition (edge of specimen) showing nature and extent of corrosion and distribution of lead-particles within the metal (× 120).

3. Copper object no. *6:* transverse section in the etched condition showing single phase Cu-based alloy, twinning strain lines and bent twins indicating further permanent deformation after crystallization and random distribution of comparatively large lead-particles (× 240).

Pl. XXXIII

1. Copper object no *11:* transverse section in the unetched condition showing intergranular corrosion at periphery and a very even distribution of very fine inclusions (× 24).

2. Copper object no. *11:* transverse section in the etched condition showing random distribution of lead-particles, non-uniform grain-size and twinned recrystallized structure (× 240).

(iii) *Remarks*

Since all the samples appeared to be oxidized to various degrees, a 100 per cent analysis has not been given in all the cases. A more detailed analysis was carried out only on the samples where the total of all the major metallic constituents was considerably below 100 per cent.

1. Described as antimony-rod; does not contain antimony,[1] but is copper alloyed with 2·21% lead.

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[1] The description of the object as antimony-rod is essentially based on its function rather than on its metal-content.–Ed.

Metallographic examination shows that the outer surface of the specimen is highly corroded. Evidence of this corrosion can be seen at the periphery of the transverse section. A very even distribution of lead-particles is seen throughout the transverse section. The randomness of the distribution is seen more clearly in the etched specimen. In the etched condition, twinned recrystallized grains are observed. Bent twins and strain lines are also observed indicating that the metal has undergone further plastic deformation after recrystallization. The colour of the specimen indicates a pure copper or copper with low alloying addition which is in solid solution with the copper.

2. Described as antimony-rod; does not contain antimony, but is pure copper with slight oxidation. No metallographic examination was done on this sample.

3. Described as antimony-rod; does not contain antimony, but is bronze containing 1·48% tin, 1·23% lead and 95·85% copper. No metallographic examination was done on the sample.

4. No chemical examination was done. Metallographic examination, however, shows the following :

Unetched, low magnification.—Uniform distribution of an inclusion throughout the cross-section. These particles are in some cases elongated. Colour suggests it to be lead. These particles are not copper oxide (Cu_2O).

Etched, low magnification.—Fine recrystallized grains, twinning evident. Inclusions are very uniformly distributed throughout the matrix.

Etched, high magnification.—Some of the inclusions are globular but at the same time they appear to exhibit some directionality due to mechanical deformation which has not been removed.

5. Described as a bangle; is a leaded brass containing 8·34% lead, 63·5% copper and 25·86% zinc. Results of metallographic examination are as follows :

Unetched, low magnification.—Two types of inclusions are evident: (i) fine and evenly distributed and (ii) large unevenly distributed, exhibiting directionality, i.e., shows direction of working. Here only the cavities are found.

Etched, low magnification.—Grain-size non-uniform, twinned recrystallized grains. Distribution of ' cavities ' shows direction of working.

Etched, high magnification.—Random distribution of both fine and coarse inclusions with respect to grain boundaries. Recrystallized structure.

For making such bangles the metal may have been first formed into a plate cut into a strip, and then given finishing operations to obtain the final shape.

6. Described as a bangle; is leaded bronze containing 9·10% tin, 1·49% lead and 85·14% copper. The remainder is most likely to be oxygen since the sample had thick adherent oxide deposit. Metallographic examination indicates the following :

Unetched, low magnification.—The area can be divided into three regions. (i) The outer edge, grey in colour. It shows grain boundaries and twinning and gives a blood-red colour in polarized light—copper oxide. There are a few black globules which do not react with the polarized light. These are the particles of Pb. which have withstood corrosion. (ii) The intermediate region. The grey phase is at grain boundaries. (iii) The innermost region. Dark globules (of lead) are uniformly distributed through the matrix which otherwise has a uniform appearance.

Etched, low magnification.—Recrystallized structures—twinning.

Etched, high magnification.—Single phase recrystallized grain show twinning. The metal is in the stressed condition although it has been recrystallized prior to this. The black globules are dispersed at random through the metal.

7. Described as a lid with ring handle; is highly oxidized leaded bronze containing 19·43% tin, 5·87% lead and 61·32% copper. The sample also contains 1·65% silica and 1·04% iron oxide and alumina, possibly by association. The sample also contains a small amount of sulphur (0·32%),

present as sulphide probably due to improper smelting. X-ray analysis showed that copper was present mostly as cuprous oxide (Cu_2O). Separate analysis shows presence of oxide. Metallographic examination was not possible.

8. Described as a bell; is a highly-oxidized leaded bronze containing 20·23% tin, 3·48% lead and 66·10% copper. X-ray examination showed that copper was present to a considerable extent as Cu_2O. Separate analysis indicated presence of oxide. Metallographic analysis was not possible.

9. Described as a bell; is highly-oxidized bronze containing 18·97% tin and 58·82% copper. It also contains 0·70% silica and 0·59% iron oxide and alumina, possibly by association. The sample also shows presence of sulphide sulphur of 0·16%. X-ray examination showed it to be mainly cuprous oxide. The sample contains about 13·54% combined oxygen along with 4·77% water. Metallographic analysis was not possible.

11. Described as a coil-like ring; appears to be slightly-corroded brass containing 77·88% copper and 17·75 % zinc with about 1·7% of associated iron oxide or alumina. Oxide content in the sample is not determined. Metallographic examination showed that the specimen is corroded on the outer surface and there is evidence of intergranular corrosion at the periphery of the transverse section. There is a random distribution of very fine particles which may be lead-particles. The etched specimen shows twinned, recrystallized structure. A longitudinal section would have informed us whether the metal was hot-worked or cold-worked and annealed. The structure is uniform throughout the section and shows thorough homogenization. This is a single phase copper alloy and is most likely to be brass (about 25-30% Zn.) with a very small amount of lead which is dispersed through the metal. The metal has undergone permanent deformation but is now in the stress free condition.

13. Described as a fragmentary channel tube; is a very highly-corroded sample of bronze containing 4·22% tin and 66·56% copper. The sample contains 2·41% silica and 3·93% iron oxide and alumina. Sulphur compounds are present to the extent of 1·22% as sulphide, and 0·43% as sulphate. The presence of sulphide may indicate improper smelting operation. The sample indicates the presence of combined oxygen (3·29%) and water (9·07%). Ignition of sample indicates an overall loss of 6·5% indicating that some carbonaceous matter may also be present in association.

(iv) *General observations*

The presence of sulphide in some of the objects indicates that most probably copper sulphide was the raw material used in the fabrication of these objects and that the smelting process was not perfect. The samples which had not much rusted appeared on the whole to be of fairly good quality.

B. Iron objects

(i) *Chemical analysis*

Out of the thirtyone iron objects received, only seven (*10*, *13*, *14*, *20*, *27*, *29* and *30*, above, pp. 122-128) were selected for chemical analysis (Tables VII and VIII). The condition of the samples was as below:

10. The object was made up of several pieces joined together by shellac. The sample was not at all metallic and as such no drillings could be taken. The analysis was carried out on small chips from a broken piece. The sample was extremely brittle and could be powdered.

13. The sample was not metallic. It was extremely hard for drilling. A portion of the sample was cleaned on a grinder and a few pieces were chipped off from one end, powdered and analysed.

14. This has a similar description as sample no. *13*. The sample taken for analysis was obtained in a similar manner.

20. This sample consisted of many pieces joined together with shellac. No free metal was seen. Analysis was carried out on the sample by chipping off small pieces from the central portion and powdering.

27. This sample was highly oxidized on the surface. No metal was observed. It was very hard for drilling. The sample for analysis was obtained by chipping a few pieces and powdering. There was a coating of shellac all over the sample.

29. This sample had a thick (¼ in.) coating of oxide, stuck on the side of the blade by shellac. It was possible, however, to reach the metallic core from the centre of the axe to get clean drillings which were analysed.

30. This sample was similar in description as above. Clean metallic drilling could be taken from the core which were analysed.

The samples, as obtained above for analysis, were digested repeatedly with hot alcohol to dissolve the shellac. The results of the chemical analysis carried out on these samples are shown in the appended Table VII.

TABLE VII

CHEMICAL ANALYSIS OF OBJECTS

CONSTITUENTS / LAB. NO. / OBJECT NO.	1796 *10*	1799 *13*	1800 *14*	1806 *20*	1813 *27*
	%	%	%	%	%
Silica (SiO_2)	4·80	1·08	0·79	1·42	2·84
Total iron expressed as ferric oxide (Fe_2O_3)	84·71	92·66	94·55	91·06	87·42
Alumina (Al_2O_3)	0·97	1·40	0·32	Nil	0·37
Titania (TiO_2)	Trace	Trace	Trace	Trace	Trace
Lime (CaO)	0·35	0·81	0·47	0·35	1·16
Magnesia (MgO)	0·42	0·38	0·20	0·32	0·60
Manganese, nickel and chromium compounds	Trace	Trace	Trace	Trace	Trace
Phosphorus pentoxide (P_2O_5)	0·42	0·38	0·27	0·62	0·52
Sulphates (SO_4)	0·32	0·19	0·23	0·23	0·25
TOTAL	91·99	96·90	96·83	94·00	93·16
	%	%	%	%	%
Ferrous oxide (FeO)	8·68	13·61	8·35	6·66	12·09
Loss on heating at 400°C (combined and free water)	6·50	3·93	5·01	7·23	6·59
Loss on ignition at 1000°C (including loss at 400°C)	6·93	3·77	5·17	8·30	8·95
*Carbon	0·43	0·56	0·48	0·58	1·08

*The presence of carbon in the sample may be due to the presence of small amounts of carbonates, or may have been derived from the residual shellac binder.

Note: Attempts were made to determine the presence of metallic iron by hydrogen evolution. The following semi-quantitative values were indicated: no. *10*, 0·5%; no. *13*, 0·5%; no. *14*, 0·7%; no. *20*, 1·1%; no. *27*, 1·7%.

(ii) *Metallographic examination*

Only two objects were subjected to metallographic examination (Table VIII).

TABLE VIII

CHEMICAL AND METALLOGRAPHIC ANALYSIS OF IRON OBJECTS

CONSTITUENTS — LAB. NO. / OBJECT NO.	1815 *29*	1816 *30*
	%	%
Carbon	0·09	0·32
Silicon	0·01	0·07
Manganese	∠0·01	∠0·01
Sulphur	0·007	0·015
Phosphorus	0·097	0·069
Nickel	P.nil	P.nil
Chromium	P.nil	P.nil
Lime	Nil	Nil
Magnesia (MgO)	0·18	0·12
Iron	99·56	98·87
Titanium	Trace	Trace

∠ denotes less than
P.nil = Practically nil

29. A small wedge-like specimen was taken and examined, both on the transverse and the longitudinal directions.

Unetched, low magnification.—This shows a very pure material with one elongated slag-particle in the area examined.

Etched, low magnification.—Equiaxed ferrite grains were observed. There is no evidence of pearlite. The grain-size is not uniform and this variation in size is more evident on the longitudinal section than on the transverse section. The metal has been worked and recrystallization has taken place. There is evidence of a very small amount of Fe_3C at the grain-boundaries. This can be revealed only by boiling in alkaline sodium picrate solution which etches Fe_3C black.

30. A small specimen was cut from the axe and two surfaces, at 90° to each other, were examined.

(*a*) *Longitudinal surface*

Unetched, low magnification.—(1) Iron oxide stringers—dark-grey in colour. This is due to the penetration of the corrosion of specimen beyond the surface that was polished. (2) Slag-particles, black in colour and showing a duplex structure. Selective etching indicated that these are iron and manganese sulphides or oxides. Within these slag-particles there are rounded slight grey particles which are aluminium oxide. The slag-particles are elongated in the direction of working.

Etched, low magnification.—The structure shows equiaxed ferrite grains and a small amount of pearlite at the grain-boundaries. The fact that the pearlite is not elongated in the

direction of working indicates that the metal was heated to the austenitic range either during or after working. There are striations across the specimen-surface where there is a localized increase in pearlite. Quite often, on either side of such striations, there are areas with less pearlite than the average. In spite of this, the amount of pearlite is fairly constant over the whole area examined.

Etched, high magnification.—The only additional information obtained was that the pearlite has a lamellar structure. This again supports the fact that the metal was cooled from the austenitic range.

(*b*) *Transverse section*

Unetched, low magnification.—The directionality indicated by the slag-particles is not as definite as on the longitudinal section. The globules of aluminium oxide form part of the slag-particles.

Etched, low magnification.—The structure shows equiaxed ferrite grains and pearlite. The striations referred to earlier are very much more evident in the transverse section. This indicates that these striations run perpendicular to the transverse section, i.e., the axe has such striations running from the shaft-hole to the tip and this would be to advantage in the use of the tool.

In addition to such localized variation in carbon-content, there is an overall variation in carbon-content from the centre of the specimen to the outer edge. This lower carbon-content at the edge of the specimen could be due to decarburization during heat-treatment.

Etched, high magnification.—The pearlite was not easily resolved to give lamellar pearlite.

The observations made on the photomicrographs (pl. XXXIII, *3* and *4* and XXXIV) of the above samples are as follows.

Pl. XXXIII

3. Iron object no. *29:* in the unetched condition (× 60).

4. Iron object no. *29:* etched with 5% Nital (× 60).

Pl. XXXIV

1. Iron object no. *30:* longitudinal section in the unetched condition (× 60).

2. Iron object no. *30:* longitudinal section in the etched condition (× 60).

3. Iron object no. *30:* transverse section in the unetched condition (× 60).

4. Iron object no. *30:* transverse section, etched with 5% Nital (× 60).

(iii) *Remarks*

Out of the seven samples subjected to chemical analysis, only two, viz. nos. *29* and *30*, had metallic cores. Metallographic examination was, therefore, possible only on these two specimens. Petrological studies by means of an ore microscope were made, under both transmitted and reflected light, on thin sections taken from nos. *10*, *14*, *27* and *29*. In the case of no. *29*, the selection was taken from the outer oxide portion which had been struck on the side of the axe blade. X-ray diffraction studies were made on the above four sections, and also powder patterns were taken on nos. *10*, *13*, *14*, *20* and *27*. All the specimens were found to be strongly magnetic.

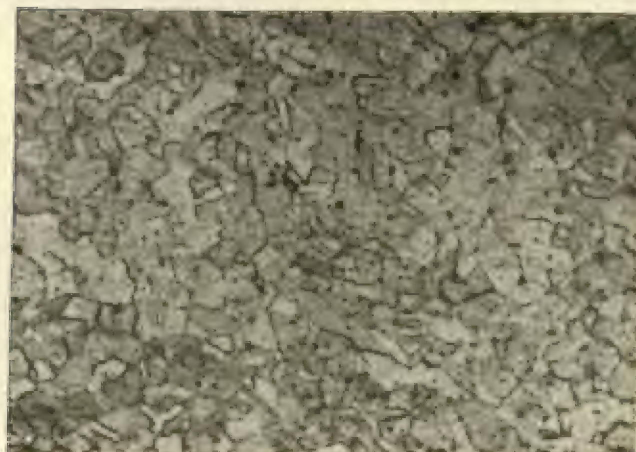
10. X-ray studies indicated that the specimen contains magnetite (Fe_3O_4) and goethite ($Fe_2O_3 + H_2O$). Under the ore microscope the specimen was found to be almost opaque except for fine stringers of crystalline quartz. It is made up of different bands which are coloured dark brown,



1



2

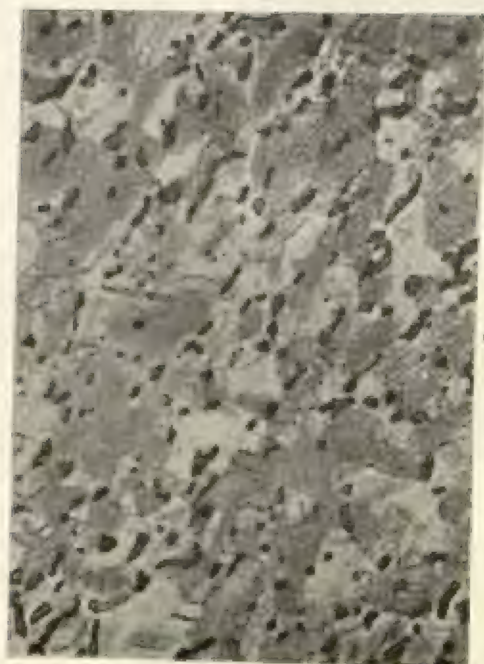


3

Photomicrographs of copper object 1. *See p. 133*



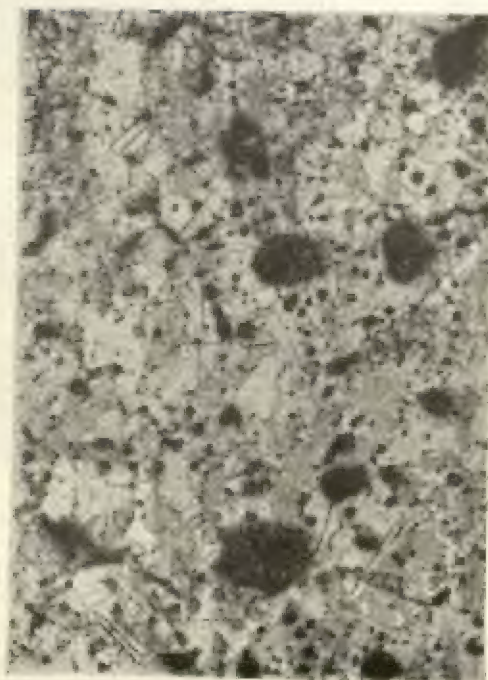
1



2

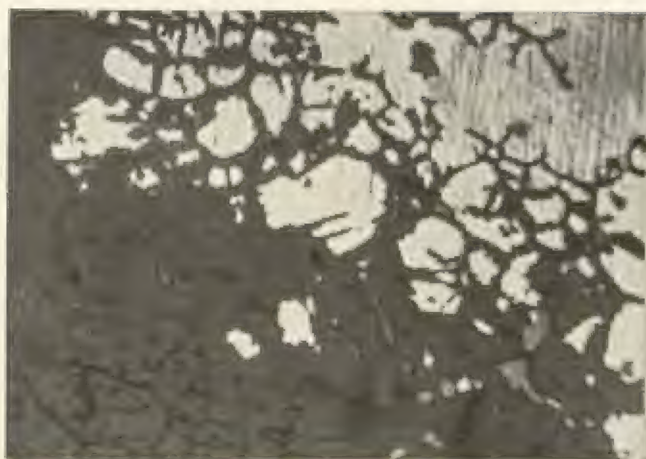


3



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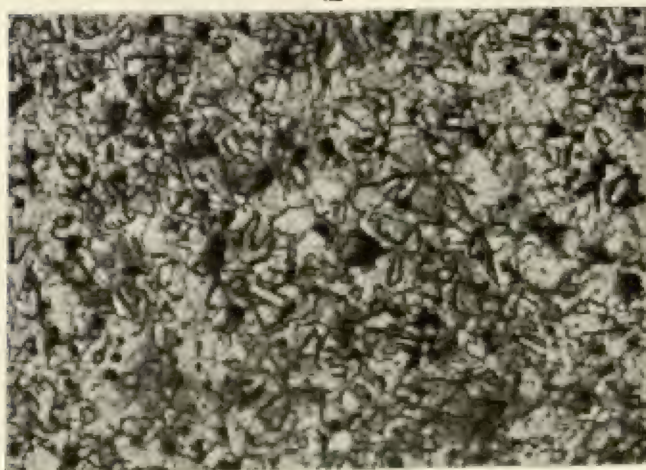
Photomicrographs of copper objects 4 and 5. *See p. 133*



1



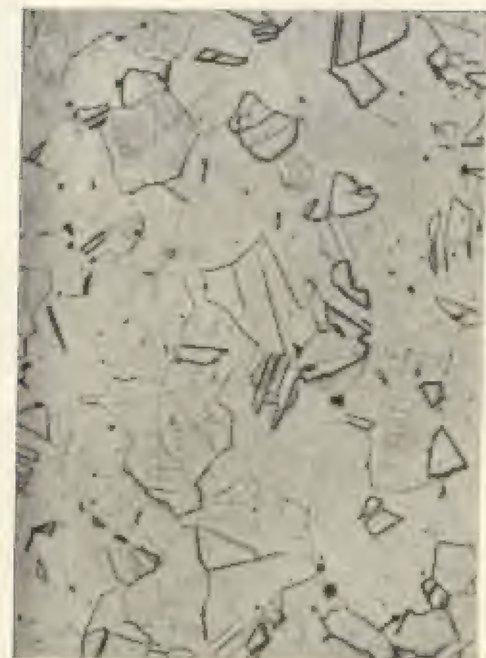
2



3

Photomicrographs of copper object 6. See p. 133

To face pl. XXXI







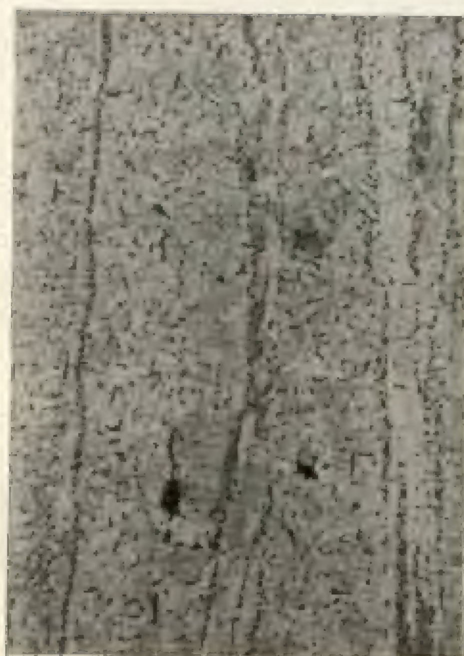


Photomicrographs of, 1 and 2, copper object 11, and 3 and 4 iron object 29. *See pp. 133 and 138*

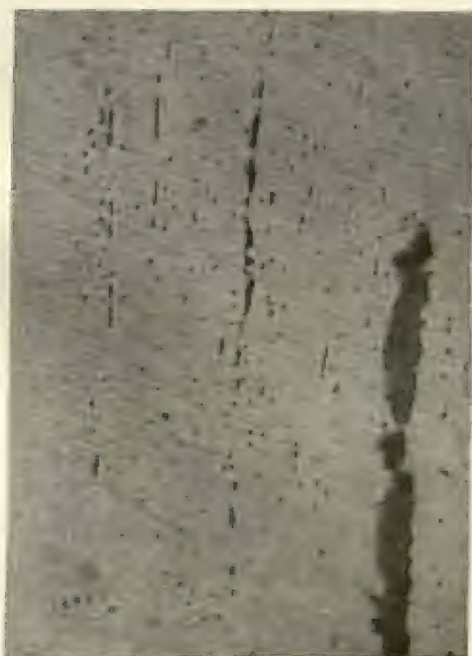
To face pl. XXXIV



2



4



1



3

Photomicrographs of iron object 30. *See p. 138*

brown and buff. A study of the polished section shows that the specimen consists essentially of oxides of iron in different stages of alternation. It consists, in order of decreasing abundance, of magnetite, goethite, haematite and limonite ($Fe_2O_3 + H_2O$), and minor amounts of silicate quartz and a carbonate (probably siderite). The specimen showed interesting concentric zonal structure with central goethite core, a middle magnetite shell and an outer limonite crust. Fine stringers of quartz-veins intercalated mostly in the limonite crust were seen.

13. X-ray and microscopic examination showed this specimen to be identical with no. *10* in composition, except for the extent of alternation of the magnetite (which forms the bulk of all the specimens studied). The only difference observed was in the structure. Instead of concentric zoning observed in no. *10*, banded structure of goethite, magnetite and haematite in alternate bands was observed in this specimen.

14. As in no. *13* above.

20. Only X-ray studies were made on this specimen which showed that it consisted mainly of magnetite and goethite.

27. As in no. *13* above.

29. The outer oxidized portion was as in no. *13* above. The inner metallic core under metallographic examination indicated that the sample was of good quality iron (above, p. 137).

30. The inner metallic core under metallographic examination indicates the same features as for no. *29* (above, pp. 137-138).

(iv) *General observations*

In the chemical analysis (above, pp. 135 and 136), it was mentioned that the presence of metallic iron in the specimens (other than nos. *29* and *30*) was vaguely indicated. A confirmation of the presence of metallic iron in these specimens was sought by X-ray and microscopic examination. This was done mainly to ascertain whether the implements were originally of metallic iron and had retained their shape and compactness after oxidation or whether they were originally fashioned out of (iron) minerals. The presence of well-known mineral structures such as magnetite, goethite and limonite in the specimens and the hardness of some of them gave rise to this doubt. However, it was not possible to definitely confirm the presence (or absence) of metallic iron by these studies because of the extremely small quantity in which the metal may be present, if at all.

In our opinion the implements were originally made of iron metal which later almost completely oxidized. This opinion is based on the following reasons: (1) There is at least some indication of the probable presence of metallic iron by chemical analysis. (2) The core of sample no. *29* is indisputably metallic. However, the oxidized portion of the sample (which was stuck on the core) was identical in structure and composition to the other specimens studied. (3) The formation of hard iron oxide minerals (goethite) by alteration of other forms of iron oxides has been reported (Dana's system of minerology).

9. PLANT-REMAINS

By K. Ramesh Rao & R. Shahi

A. Introduction

The plant-remains from the archaeological excavation at Prakash came from three distinct occupational or cultural Periods, the earliest of which dates back to the middle of the second millennium B.C. No specimen was sent from Period IV. The material received for examination was in the form of small pieces of charcoal, mostly of wood,

numbering approximately eight hundred. The findings reported here are based on cereful examination of the specimens in gross with a hand-lens, supplemented by detailed study of selected and suitably-processed material under a microscope. On the whole, the carbonization of the wood-substance was more or less complete with the result that the structural details have not been preserved too well. However, in spite of the fragmentary nature of the material, and unsatisfactory state of preservation, it has been possible to determine the botanical identity of most of the specimens received by us, with a fair degree of accuracy. Seven different types of wood and one bamboo have been identified, which are of considerable economic importance in the region and include well-known and valuable timbers like teak (*Tectona grandis*) and rosewood (*Dalbergia latifolia*).

B. Material

The material, comprising in all seventeen samples, was sent to us carefully packed in cotton-wool, in an equal number of packets serially numbered 1 to 17. On each packet the registered number of the sample, site, locus, stratum and period were clearly indicated. All the samples consisted only of charcoal and were from a single site, PRK-1, but belonged to three distinct occupational Periods: samples *1* to *8*, Period I (*circa* 1700-1300 B.C.); samples *9* to *13* and *17*, Period II (*circa* 600-100 B.C.); and *14* to *16*, Period III (middle of the second century B.C. to the end of the sixth century A.D.).

The number and size of the charcoal-pieces varied considerably in different samples. Some of the samples contained only three to four pieces, while others comprised well over a hundred. The size of the largest piece in a sample ranged from 7 × 3 × 10 mm. to 30 × 25 × 40 mm., while the smaller pieces, which formed the majority, often did not exceed 2 to 3 mm. in the direction of the longest dimension. A preliminary survey of the material showed that all the specimens were of plant-origin and as such worth taking up for detailed examination from the botanical point of view. It was also observed that while some samples consisted of only one kind of charcoal, others indicated two or more distinct types of different botanical origin.

The condition of the material on the whole was not very good. Most of the charcoal-pieces had fine cracks both across and along the grain as a result of which they tended to break up and disintegrate during examination and processing. The preservation also was far from satisfactory in many of the samples.

C. Method of study

As preliminary checking of the material had indicated the possibility of more than one type of charcoal occurring in a sample, it was considered advisable to examine first in gross all the charcoal-pieces in the various samples, with a view to classifying them into main groups based on structure. For this purpose, a pocket-lens magnifying 10 times proved to be generally adequate, though in some cases examination of freshly-broken surfaces in reflected or incident light under a microscope at low magnifications of 30, was found to be more accurate and reliable. Based on such microscopic examination, a number of pieces, representing all the different types of charcoal found in the seventeen samples, were selected for a detailed study of the anatomical structure. The selected pieces were embedded and sectioned according to the usual methods[1] followed for

[1] K. A. Chowdhury and S. S. Ghosh, 'The study of archaeological plant-remains and its significance', *Trans. Bose Res. Inst.*, (Calcutta, 1955); S. S. Ghosh and Krishna Lal, 'Plant-remains from Rangpur', *Ancient India*, nos. 18 and 19, *op. cit.*, pp. 161-75.

TABLE IX

DETERMINATION OF CHARCOAL-REMAINS

SAMPLE NO.	REGISTERED NO.	PERIOD	CONTENTS	IDENTIFICATION
1	440	I	About sixty pieces of two types	(a) *Tectona grandis* (b) *Acacia* sp.
2	425	I	Over a hundred pieces of three types	(a) *Tectona grandis* (b) *Acacia* sp. (c) *Anogeissus* sp.
3	579	I	Over a hundred pieces of three types	(a) *Holarrhena antidysenterica* (b) *Acacia* sp. (c) *Tectona grandis*
4	539	I	About twenty pieces, all of one type	*Acacia* sp.
5	569	I	About twenty pieces of two types	(a) *Acacia* sp. (b) *Tectona grandis*
6	475	I	About fifty pieces of six types	(a) *Acacia* sp. (b) *Tectona grandis* (c) *Anogeissus* sp. (d) *Dalbergia latifolia* (e) *Terminalia* sp. (f) *Dendrocalamus* sp.
7	358	I	About twentyfive pieces of three types	(a) *Acacia* sp. (b) *Tectona grandis* (c) *Albizzia* sp.
8	568	I	Over a hundred pieces of five types	(a) *Acacia* sp. (b) *Tectona grandis* (c) *Anogeissus* sp. (d) *Holarrhena antidysenterica* (e) *Terminalia* sp.
9	353	II	About sixty pieces of two types	(a) *Acacia* sp. (b) *Dalbergia latifolia*
10	350	II	Three small badly-deteriorated pieces	Not identified
11	373	II	About twenty pieces, all of one type	*Tectona grandis*
12	367	II	About fifty pieces of two types	(a) *Tectona grandis* (b) Not identified
13	443	II	About fifty pieces of two types	(a) *Acacia* sp. (b) Not identified
14	441	III	About forty pieces of one type	*Tectona grandis*
15	177	III	About fifty pieces of two types	(a) *Acacia* sp. (b) *Anogeissus* sp.
16	165	III	About twentyfive pieces of four types	(a) *Acacia* sp. (b) *Tectona grandis* (c) *Terminalia* sp. (d) *Anogeissus* sp.
17	585	II	About thirty pieces of two types	(a) *Dalbergia latifolia* (b) *Tectona grandis*

such material. The photomicrographs (pls. XXXV-XXXVIII) were taken with a Reichert Universal Camera Microscope in transmitted light.

D. Results of study and identification

The study revealed the presence of about ten kinds of charcoal in the different occupational strata. Of these, the botanical identity of eight types, including seven woods and one bamboo, has been determined as shown in Table IX. The identification of the remaining types has not been possible as the material available for study was too small and fragmentary or the preservation was so poor that a true picture of the anatomical structure could not be obtained.

From the sample-wise determinations given in the Table, it will be apparent that while some samples (nos. *4*, *11* and *14*) consist of only one type of charcoal, others (nos. *6*, *8* and *16*) contain as many as four to six. Another point of interest is the repeated occurrence of the same type of charcoal in several samples. For instance, both teak (*Tectona grandis*) and *Acacia* sp. have been found in twelve out of the seventeen samples studied. Therefore, in order to avoid needless repetition it is proposed to consider here only the different types of charcoal, according to their botanical affinities.

TYPE 1: *TECTONA GRANDIS* Linn. f.

(Fig. 45, *1* and *2*; pl. XXXV, *1* and *2*)

Material.—Samples *1* to *3*, *5* to *8*, *11*, *12*, *14*, *16* and *17*.

General features.—The large number of charcoal-specimens falling under this category vary considerably in size from very small fragments to fairly big pieces, the largest measuring about 3.0

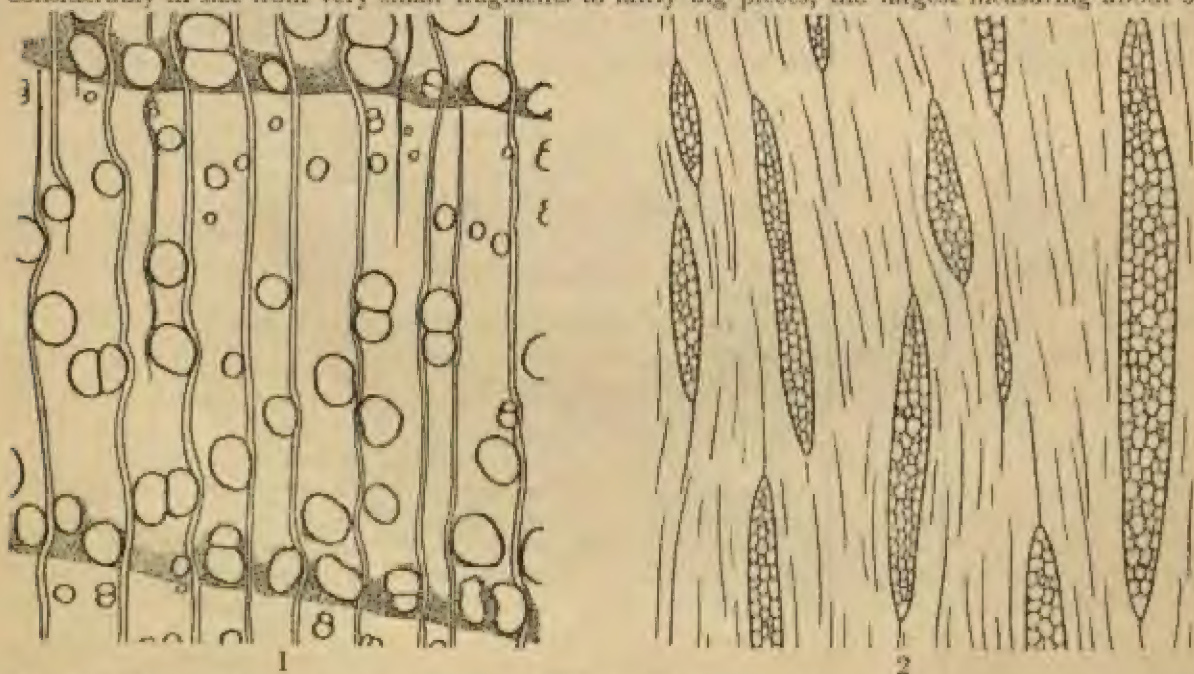


Fig. 45. *Plant-remains, type 1: 1, transverse section (× 32) showing ring porous character and parenchyma embedding the larger early wood vessels at the beginning of the growth ring; 2, tangential section (× 135) showing ray composition and distribution*

× 25 × 40 mm. Most of the pieces are irregular in shape and show, in addition to fine cracks across the grain, a tendency to split concentrically along the growth-marks and also occasionally in the radial direction along the rays. The grain, as could be seen from some of the larger pieces, is usually straight to somewhat twisted in the region of knots, and the texture is medium-coarse and uneven.

ANATOMICAL STRUCTURE.—It is a *ring porous* to *semi-ring porous* wood; the *ring porous* character, however, is not always conspicuous, being hardly apparent in many of the smaller pieces. *Growth-rings* are usually distinct, delimited by a fairly continuous to somewhat interrupted row of large early wood vessels, 3 to 12 per cm. *Vessels* are large and distinct to the eye in the early wood, gradually becoming smaller and visible only under a lens in the late wood; the large early wood vessels are 168 to 252μ in diameter, while the smaller ones in the late wood are only 42 to 56μ. *Parenchyma* is initial and paratracheal, surrounding and partially embedding the early wood vessels, but the individual cells are usually indistinct under the microscope due to collapse of the tissues. *Rays* are fine to fairly broad and rather wide apart to fairly closely-spaced (5 to 8 per mm.), 1 to 5 seriate, the largest up to 84μ in width and up to fortytwo cells or 728 μ in height; homocellular to somewhat heterocellular.

TYPE 2: *ACACIA* SP.

(Fig. 46, *1* and *2;* pl. XXXV, *3* and *4*)

MATERIAL.—Samples *1* to *9, 13, 15* and *16.*

GENERAL FEATURES.—The material, though abundant and well represented, is mostly of irregular shape and rather small in size, even the biggest piece not exceeding 10 × 8 × 15 mm. The preservation varies from fairly good in some samples to very bad in others. Further, due to the presence of minute horizontal cracks and longitudinal fissures, even the good pieces often crumble into small bits while handling. The grain is fairly straight to slightly twisted and the texture even and medium-coarse.

ANATOMICAL STRUCTURE.—It is a *diffuse-porous* wood. *Growth-rings* are usually indistinct, but sometimes faintly visible, delimited by a fine interrupted line of parenchyma observed only in a few

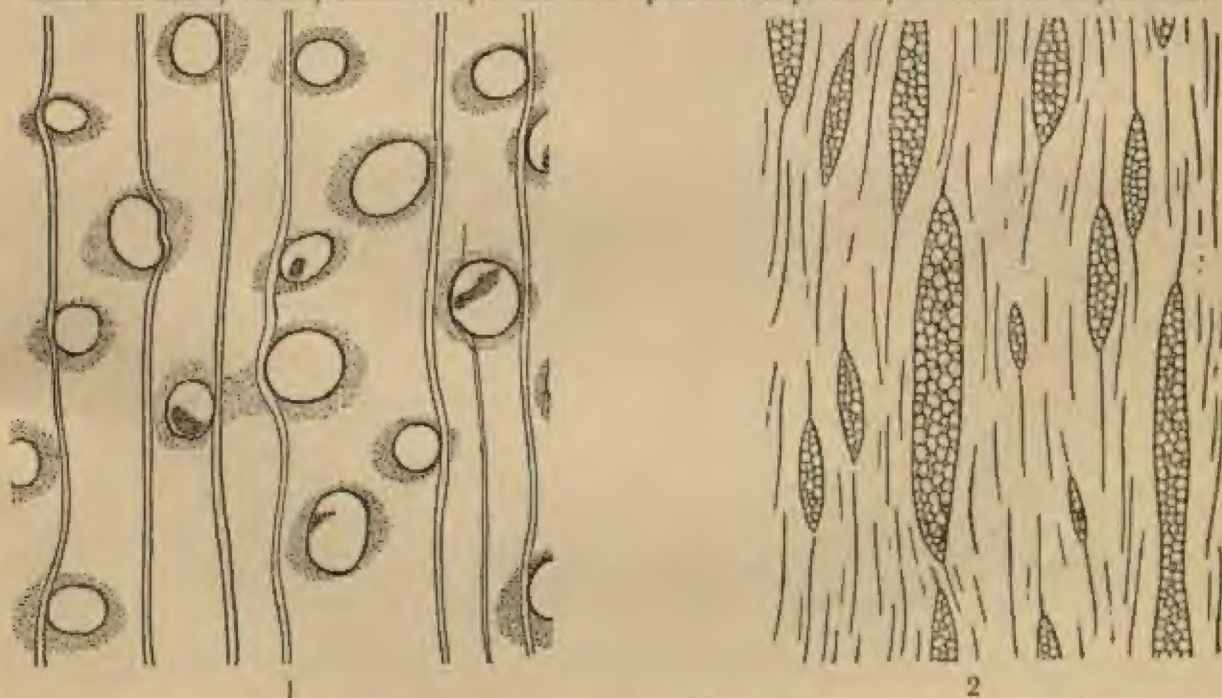


FIG. 46. *Plant-remains, type 2: 1, transverse section (× 60) showing vessel arrangement and parenchyma distribution; 2 tangential section (× 135) showing 1-5 seriate homocellular rays*

specimens. *Vessels* are small to medium-sized or moderately large, the latter just visible to the eye and the former visible only under the lens, few to moderately numerous, mostly solitary with an occasional radial multiple of 2 or rarely more; round to somewhat oval in outline, the largest measuring 140 to 238μ in diameter; often with hardened black gum partially filling the vessel cavity. *Parenchyma* is typically vasicentric forming a narrow to fairly broad roundish sheath surrounding the vessels, occasionally confluent, connecting adjacent pores, distinctly visible under the lens. *Rays* are mostly moderately broad, somewhat wide apart to fairly closely-spaced (5 to 9 per mm.), 1 to 5 seriate, the largest up to 56μ in width and up to thirtysix cells and 462μ in height; homocellular.

TYPE 3: *ANOGEISSUS* SP.

(Fig. 47, *1* and *2*; pl. XXXVI, *1* and *2*)

MATERIAL.—Samples *2, 6, 8, 15* and *16*.

GENERAL FEATURES.—The material consists of less than twenty charcoal pieces which are mostly small, irregularly-shaped and very fragile. The largest piece is about 10 × 5 × 15 mm. and shows fairly straight grain. The texture is fine and even.

ANATOMICAL STRUCTURE.—It is a *diffuse-porous* wood. *Growth-rings* are inconspicuous in the material available for study, demarcated by a fibrous zone containing fewer vessels. *Vessels* are small to very small, visible only under the lens; moderately numerous to numerous, mostly solitary and in short radial multiples of 2 to 3; round to oval in outline, with a maximum tangential diameter of 70 to 112μ *Parenchyma* is predominantly paratracheal, occurring as an irregular sheath round the vessels, vasicentric to aliform often extending sideways and somewhat diagonally, forming short, wavy, tangential or oblique bands connecting adjoining vessels; just visible under the lens but cellular structure not very distinct under the microscope due to poor preservation. *Rays* are fine to very fine, numerous and very closely-spaced (14 to 22 per mm.), mostly uniseriate, interspersed with a few

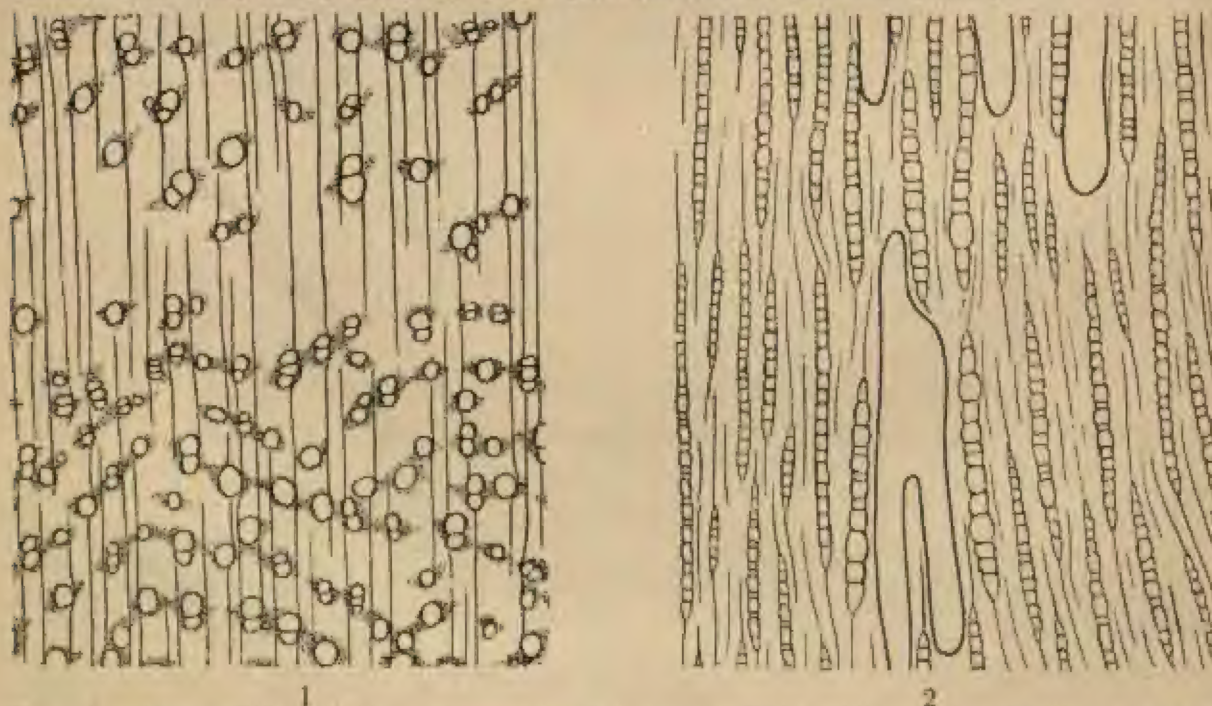


FIG. 47. *Plant-remains, type 3: 1, transverse section (× 50) showing small vessels, vasicentric to aliform confluent parenchyma and fine rays; 2, tangential section (× 135) showing numerous closely-spaced, uniseriate heterocellular rays*

partly biseriate ones, 21 to 35μ in width and up to 420μ in height; heterocellular, but individual ray cells are not very clear due to deterioration.

TYPE 4: *DALBERGIA LATIFOLIA* ROXB.

(Fig. 48, *1* and *2*; pl. XXXVI, *3* to *6*)

MATERIAL.—Samples *6*, *9* and *17*.

GENERAL FEATURES.—The charcoal pieces of this type number a little over twenty and some of them are fairly big measuring about 30 × 15 × 35 mm. They are usually irregular in shape, some being knotty and twisted. Some of the pieces show fairly good preservation, while others are badly deteriorated, crumbling at the slightest touch. The grain is mostly straight and the texture medium-coarse to medium-fine.

ANATOMICAL STRUCTURE.—It is a *diffuse-porous* wood. *Growth-rings* are indistinct. *Vessels* are small to medium-sized or moderately large, the latter just visible to the eye; few to moderately numerous, mostly solitary with an occasional short radial multiple; roundish to oval in outline and 154 to 196μ in tangential diameter, their cavities sometimes filled in part with gummy deposits. *Parenchyma* is predominantly paratracheal and distinctly visible under the lens on the freshly-broken surface of the

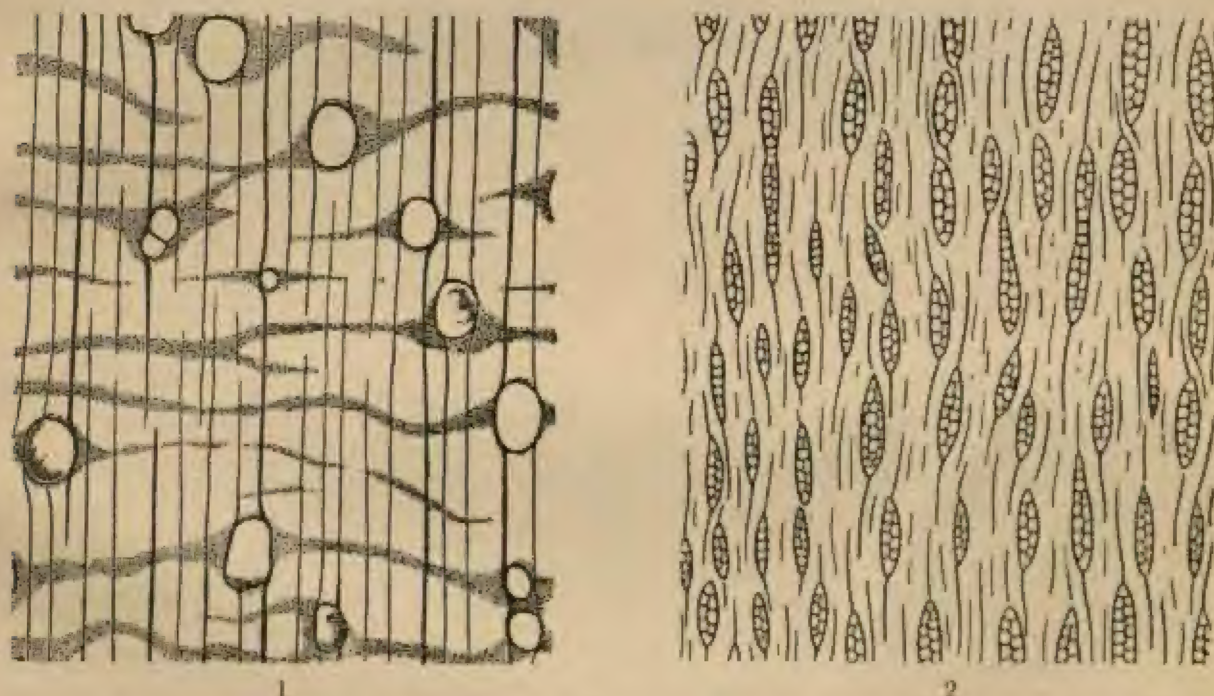


FIG. 48. *Plant-remains, type 4: 1, transverse section (× 60) showing characteristic parenchyma and closely-spaced fine rays; 2, tangential section (× 135) showing storeyed arrangement of the low rays*

charcoal, mostly round the vessels forming eyelets with lateral extensions frequently connecting neighbouring vessels as thin, wavy or fairly straight tangential bands. *Rays* are rather fine, numerous and closely-spaced (14 to 19 per mm.); 1 to 3 (mostly 1 to 2) seriate and 14 to 35μ in width, rather low, usually less than ten cells and 154μ in height, showing distinct storeyed arrangement, though a few rays may be two or even three storeys and up to twentyseven cells and 378μ high; homocellular. *Ripplemarks* are present 65 to 70 per cm.

TYPE 5: *TERMINALIA* SP.

(Fig. 49, *1* and *2*; pl. XXXVII, *1* to *3*)

Material.—Samples *6*, *8* and *16*.

General features.—The material is very limited and consists of only six to seven charcoal-pieces. The pieces are small, fragile and irregular in shape, the largest measuring 6 × 4 × 15 mm. The grain is straight and the texture medium-coarse.

Anatomical structure.—It is a *diffuse-porous* wood, most of the specimens being of rather slow-grown. *Growth-rings* are usually distinct, delimited by a fine line of *parenchyma*, about 5 to 8 per cm. *Vessels* are medium-sized to fairly large, just visible to the eye, distinct under the lens; few to moderately numerous, mostly solitary and in short radial multiples; roundish to oval in outline, but often distorted in shape due to compression; tangential diameters of the large vessels vary from 154 to 238μ. *Parenchyma* is initial and paratracheal, distinctly visible under the lens, the former delimiting the growth-rings as a fine more or less continuous line and the latter aliform to aliform confluent connecting neighbouring vessels. *Rays* are very fine and very closely-spaced (12 to 20 per mm.); mostly uniseriate, occasionally with one or two paired cells in the middle, 14 to 28μ in width and up to twentyfour cells and 378μ in height; homocellular or nearly so.

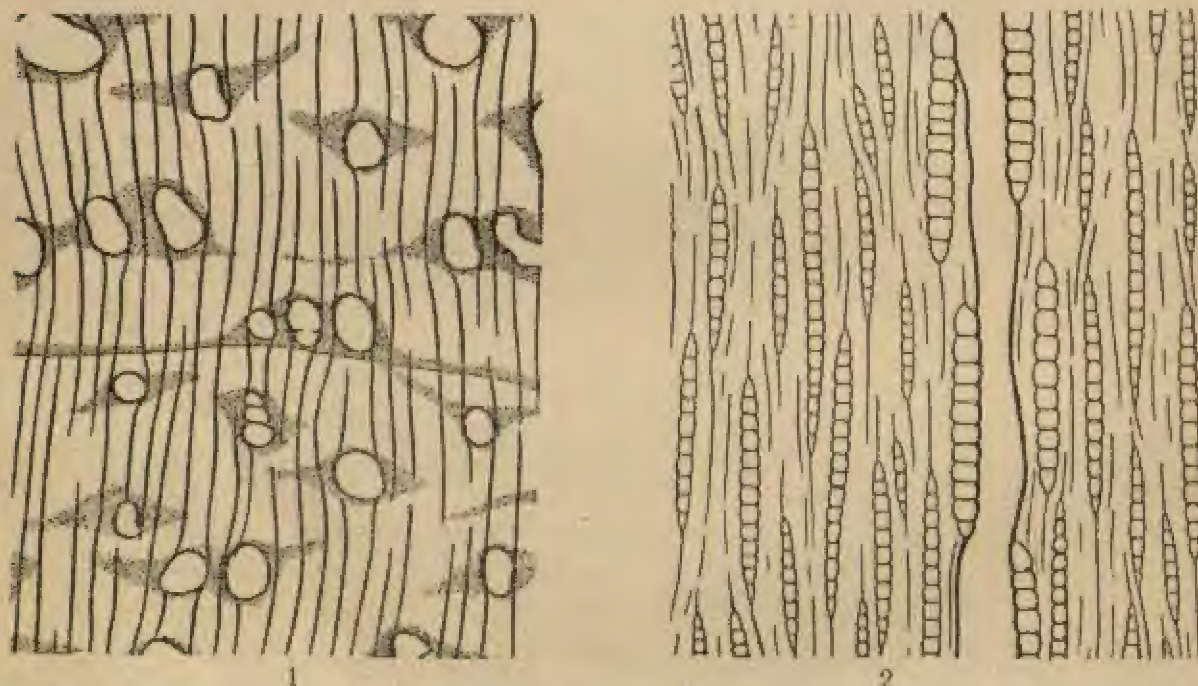


Fig. 49. *Plant-remains, type 5: 1, transverse section (× 60) showing distinct growth-ring delimited by parenchyma and aliform to aliform confluent parenchyma round the vessels; 2, tangential section (× 135) showing distribution of uniseriate homocellular rays*

TYPE 6: *HOLARRHENA ANTIDYSENTERICA* WALL

(Fig. 50, *1* and *2*; pl. XXXVII, *4* and *5*)

Material.—Samples *3* and *8*.

General features.—The charcoal-pieces are quite numerous but rather small and irregularly-shaped, often showing fine cracks both across and along the grain. The largest piece is about 8 ×

10 × 18 mm. All the pieces are of uniform fine texture. The grain, however, is variable being straight in some and twisted in others.

ANATOMICAL STRUCTURE.—It is a *diffuse-porous* wood. *Growth-rings* are indistinct. *Vessels* are small to very small, visible only under the lens; very numerous, mostly in radial multiples of 2 to 4 or more occasionally solitary; oval to orbicular in shape, the largest 84 to 98μ in tangential diameter. *Parenchyma* is apotracheal, diffuse to diffuse-aggregate, visible only under the microscope as scattered cells in the fibrous ground mass, often aggregated to form short tangential lines connecting adjacent rays. *Rays* are fine and closely-spaced (8 to 16 per mm.); 1 to 3, rarely 4 seriate, the largest 42μ wide and up to twentyfour cells and 476μ in height; both homocellular (uniseriates) and heterocellular (multiseriates).

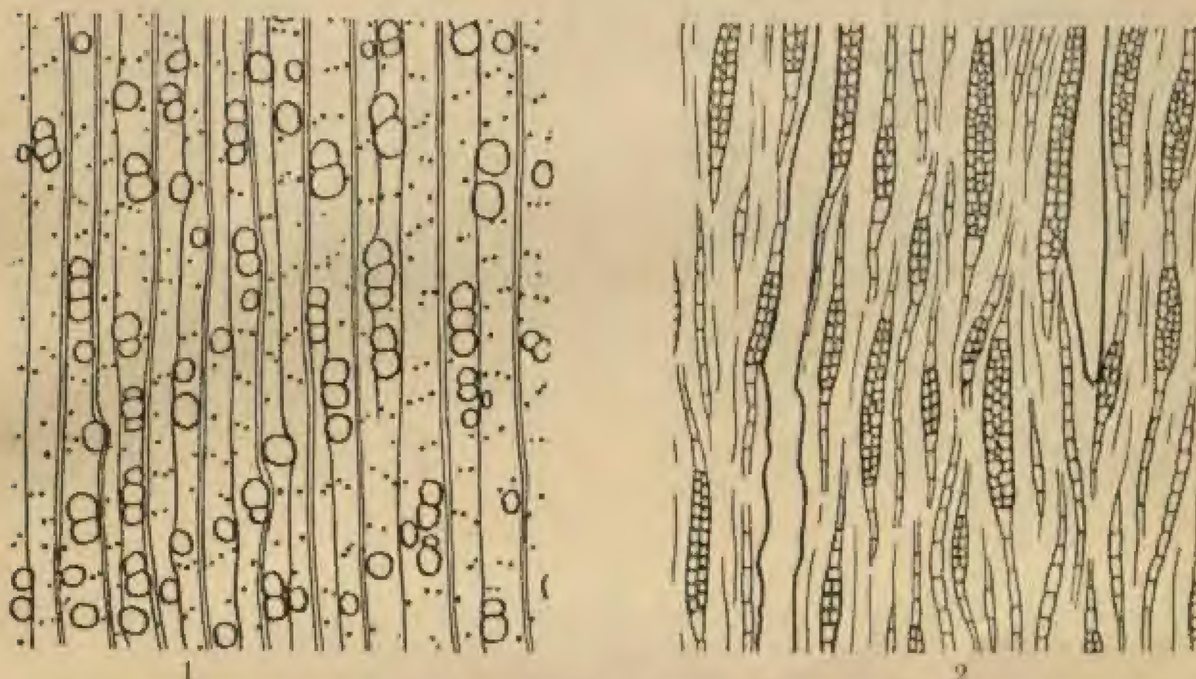


FIG. 50. *Plant-remains, type 6: 1, transverse section (× 60) showing vessel arrangement and parenchyma distribution; 2, tangential section (× 135) showing distinct heterocellular multiseriate rays*

TYPE 7: *ALBIZZIA* SP.

(Fig. 51, *1* and *2*; pl. XXXVIII, *1* and *2*)

MATERIAL.—Sample 7.

GENERAL FEATURES.—The few (6 to 7) charcoal-pieces of this type are all irregularly-shaped and vary in size from 6 × 3 × 6 mm. to 8 × 5 × 13 mm. All of them have fine horizontal cracks and longitudinal fissures and tend to break easily. The grain is straight and the texture medium-coarse.

ANATOMICAL STRUCTURE.—It is a *diffuse-porous* wood. *Growth-rings* are indistinct in the limited field available for study. *Vessels* are small to mostly medium-sized or large, the latter just visible to the eye and distinct under the lens; moderately few to moderately numerous, the majority solitary with an occasional short radial multiple; round to oval in outline, but often distorted and appearing lenticular due to compression; tangential diameter of the larger vessels varies from 154 to 280μ; some of the vessels are partially plugged with dark, blackened gummy deposits. *Parenchyma* is paratracheal, predominantly aliform and clearly visible under the hand-lens, forming conspicuous 'eyelets' round the

vessels and rarely connecting adjacent ones; individual *parenchyma* cells are usually not distinct under the microscope, being often crushed and torn as a result of compression and deterioration. *Rays* are mostly medium fine to moderately broad, fairly closely-spaced (7 to 10 per mm.); 1 to 5 seriate, the largest up to 56μ wide and up to thirtyeight cells and 420μ in height; homocellular.

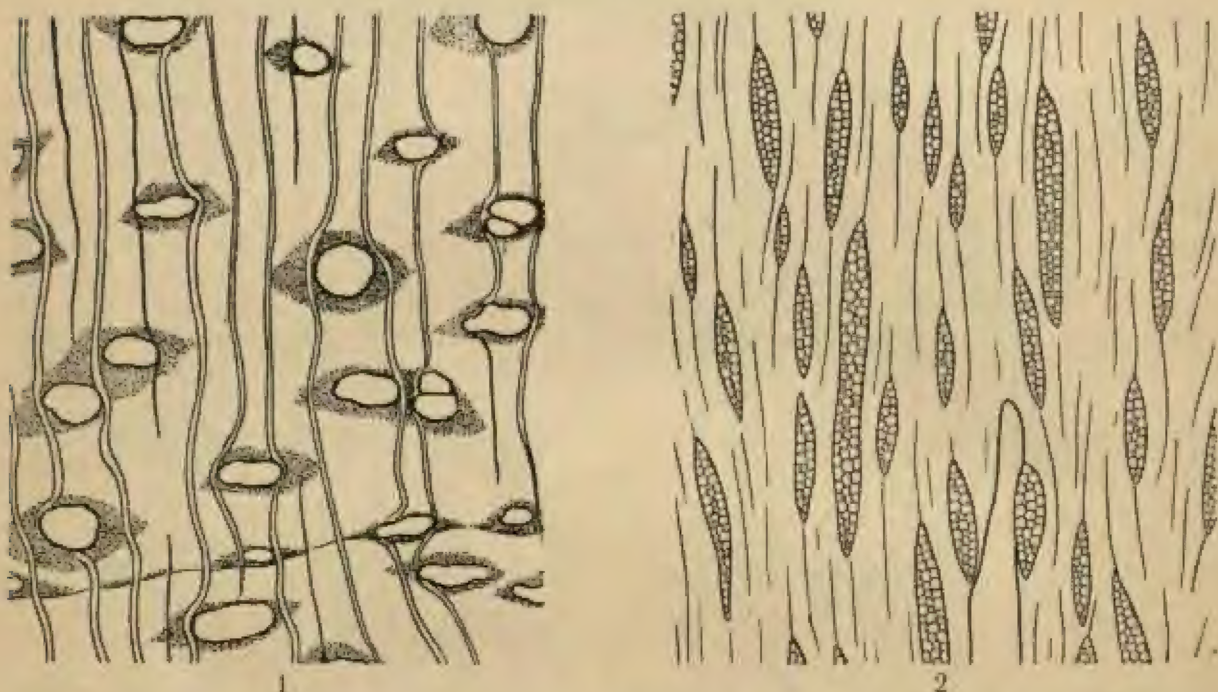


FIG. 51. *Plant-remains, type 7: 1, transverse section (× 60) showing typical aliform parenchyma; 2, tangential section (× 135) showing homocellular rays*

TYPE 8: *DENDROCALAMUS* SP.

(Fig. 52, *1* and *2*; pl. XXXVIII, *3* and *4*)

MATERIAL.—Sample *6*.

GENERAL FEATURES.—Unlike specimens of wood-charcoal described earlier, the material, though limited, consists of charcoal-pieces which are more or less regular in shape and comparatively free from cracks. The largest pieces vary in size from 5 × 4 × 18 mm. to 8 × 7 × 18 mm. The grain in all the pieces is perfectly straight.

ANATOMICAL STRUCTURE.—All the six pieces show the typical *monocotyledonous structure* of a bamboo culm, with numerous fibro-vascular bundles scattered in the *parenchymatous* ground mass. From the general arrangement and appearance of the vascular bundles all the specimens appear to be from the middle or transitional zone of the wall of the culm, the outer or peripheral region comprising the epidermis and hypodermis and the inner portion next to the central cavity being not represented.

The fibro-vascular bundles show two large metaxylem vessels, located on either side and a little to the inside of the triangular phloem. The protoxylem elements are not seen, being completely obliterated. The metaxylem vessels and the phloem are also badly distorted and crushed often losing their separate identity and forming a single irregular cavity. Subtending the phloem externally and the xylem internally are the two massive and conspicuous fibre-caps which are reniform to somewhat heart-shaped in outline. The fibres of the phloem-cap and the xylem-cap abut directly

on and are attached to the phloem and xylem respectively without any intervening *parenchyma*. This type of structure is characteristic of the fibro-vascular bundles of the transitional zone of some species of *Dendrocalamus* like *D. strictus* and *D. longispathus*. The *parenchyma* cells of the ground mass are all squarish with fairly thick walls as in *D. longispathus*. However, as all species of *Dendrocalamus* were not available for comparison, the charcoal specimens have been identified up to the genus only.

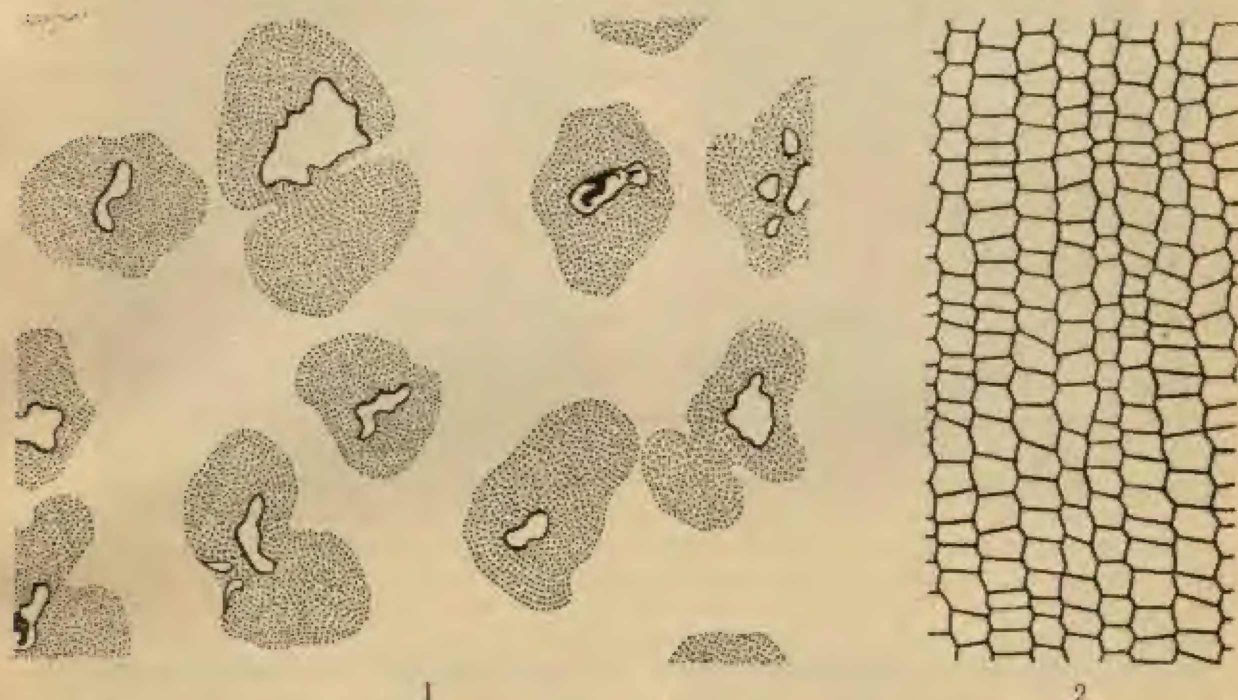


Fig. 52. *Plant-remains, type 8: 1, transverse section (× 50) showing general distribution and structure of vascular bundles; 2, longitudinal section (× 145) showing characteristic shape of the cells of the ground tissue*

E. Discussion

Apart from their botanical interest, the identifications of the charcoal-remains from Prakash, reported above, are of considerable significance in view of the light they might possibly throw on the past vegetation, climate and culture that prevailed in the region during the period from the second quarter of the second millennium B.C. to about A.D. 600. Several plant-species have been recognized in the studied charcoal-material, but all of them do not appear to be of equal importance. For the sake of convenience of comparison, the frequency of occurrence of the different species is summarized in Table X below.

From Table X it will be seen that from the point of view of numbers and occurrence, *Tectona grandis* and *Acacia* sp. are the most important. They are both represented in as many as twelve out of the seventeen samples and have been found in all the three periods. They also constitute over six hundred out of a total of about eight hundred charcoal-pieces received for examination. *Anogeissus* sp., *Dalbergia latifolia* and *Terminalia* sp. are next in importance, being represented in five, three and three samples respectively. Of these three, *Anogeissus* sp. and *Terminalia* sp. have been observed in Periods I and III, while *Dalbergia latifolia* has been recorded in Periods I and II. The remaining

TABLE X

FREQUENCY OF OCCURRENCE OF DIFFERENT TYPES OF CHARCOAL

SL. NO.	IDENTIFICATION	SAMPLES			TOTAL
		PERIOD I	PERIOD II	PERIOD III	
1	*Tectona grandis*	Nos. *1* to *3*, *5* to *8*	Nos. *11*, *12* and *17*	Nos. *14* and *16*	12
2	*Acacia* sp.	Nos. *1* to *8*	Nos. *9* and *13*	Nos. *15* and *16*	12
3	*Anogeissus* sp.	Nos. *2*, *6* and *8*	—	Nos. *15* and *16*	5
4	*Dalbergia latifolia*	No. *6*	Nos. *9* and *17*	—	3
5	*Terminalia* sp.	Nos. *6* and *8*	—	No. *16*	3
6	*Holarrhena antidysentrica*	Nos. *3* and *8*	—	—	2
7	*Albizzia* sp.	No. *7*	—	—	1
8	*Dendrocalamus* sp.	No. *6*	—	—	1

three species, viz. *Holarrhena antidysenterica*, *Albizzia* sp. and *Dendrocalamus* sp., have been found only in Period I and are represented by only one or two samples.

The picture of the floristic composition that we are able to visualize from a careful analysis of the charcoal-records at Prakash may be far from complete, but it gives at least some glimpse of the type of vegetation that might have existed in the region over three thousand years ago. In this connection the frequent and repeated occurrence in large numbers of *Tectona grandis* and *Acacia* sp. in the charcoal-remains is of no little significance. The association of these two main species with smaller quantities of other species like *Anogeissus* sp., *Terminalia* sp. and *Dalbergia latifolia* in some of the samples, along with the presence of bamboo, gives the impression of a dry deciduous type of forest with teak and *Acacia* as the preponderant species.

It would be interesting to find out how this compares with the present vegetation of the West Khandesh region in Maharashtra. Osmaston[1] has recorded seventythree species of trees and shrubs, one bamboo and two grasses as occurring in West Khandesh Division. Of these, the first five in order of frequency are: (i) *salai* (*Boswellia serrata*); (ii) *sag* (*Tectona grandis*); (iii) *damoda* (*Anogeissus latifolia*); (iv) *khair* (*Acacia catechu*) and (v) *sadada* (*Terminalia tomentosa*). According to him all these five species are so far ahead of all others in number that they be classed generally as the prevailing species.[2] As already stated earlier, the predominant species in the charcoal-remains are teak (*Tectona grandis*) and *Acacia* sp. Though the exact species of the latter has not been given, almost all the charcoal-pieces of that type showed great similarity in structure to *Acacia catechu* and could well be all of *khair*. Similarly, in the case of *Anogeissus* and *Terminalia*, the available anatomical evidence points towards *Anogeissus latifolia* and *Terminalia tomentosa*, but in view of the poor state of preservation we have thought it advisable to confine our determinations to the generic level only. Thus it would appear that four out of the five prevailing species of the region at present are strongly represented in the charcoal-remains

[1] L. S. Osmaston, *Working Plan of the Shirpur and Shahada East Satpudas of the West Khandesh Division* (Calcutta, 1907), pp. 42-43.

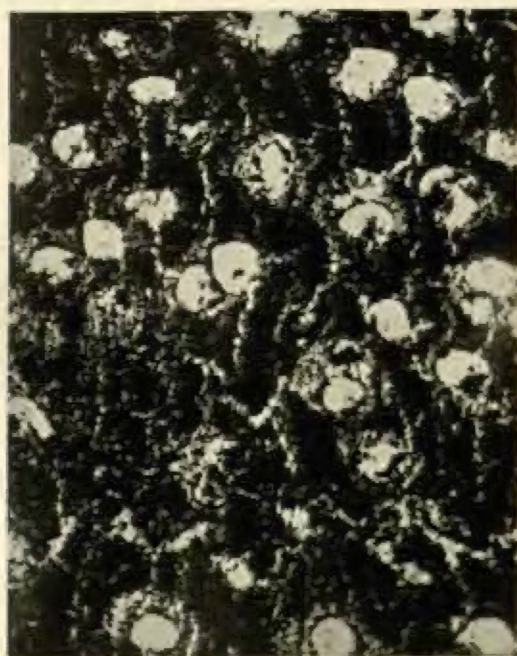
[2] *Ibid.*, p. 7.



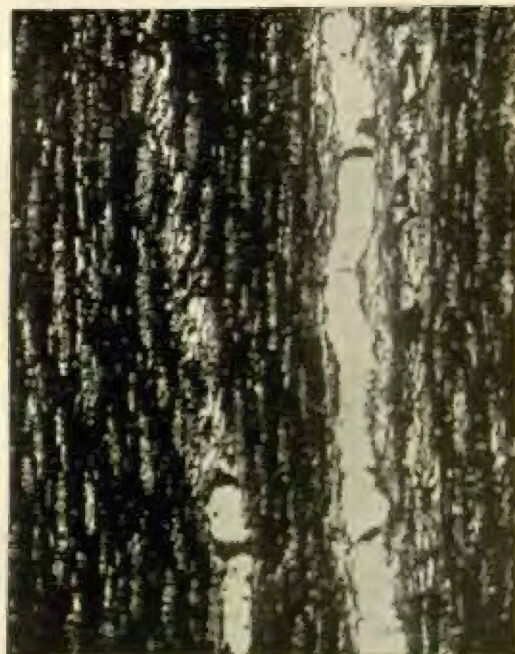
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2



3

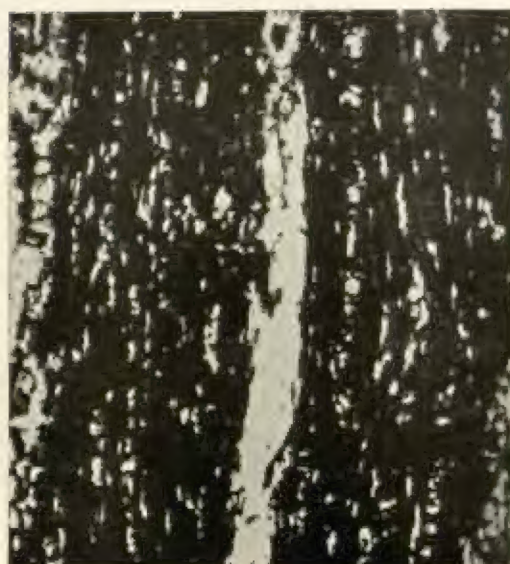


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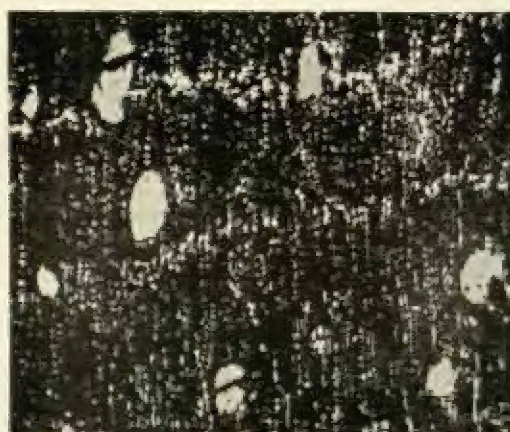
Plant remains: 1 and 2, Tectona grandis Linn.; 3 and 4, Acacia sp. *See p. 152*

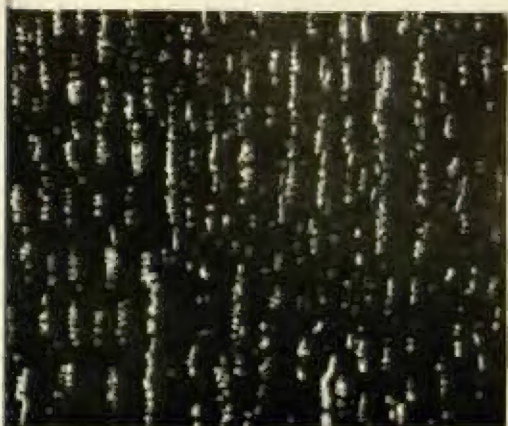
To face p 150


1


2


3


4


5


6

Plant remains: 1 and 2, Anogeissus sp; *3 to 6, Dalbergia latifolia Roxb. See pp. 152-53*

To face pl. XXXVII



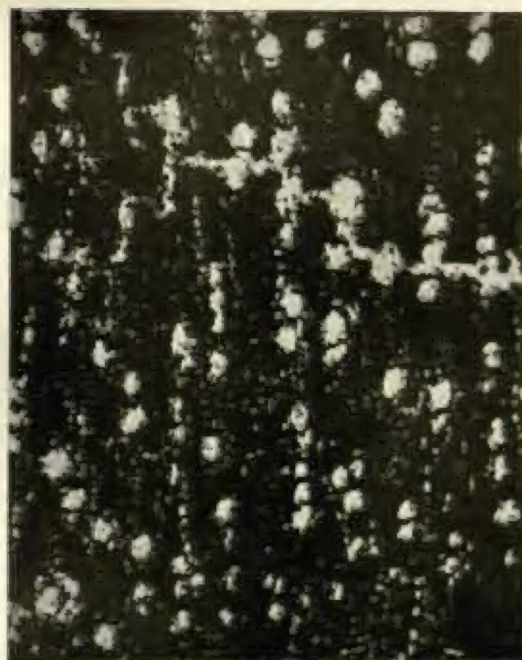
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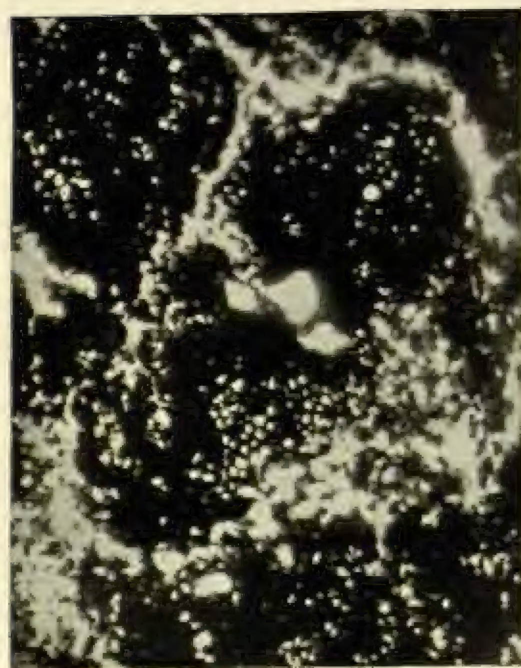


5

Plant remains: 1 to 3, Terminalia sp.; *4 and 5, Holarrhena antidysenterica.* *See p. 153*


1


2


3


4

Plant remains: 1 and 2, Albizzia sp.; *3 and 4 Dendrocalamu* sp. *See p. 153*

To face p. 151

more or less in the same order. The only interesting exception is *Boswellia serrata* which is conspicuous by its absence in the material from Prakash. Of the other types observed in the charcoal, *Dalbergia latifolia*[1] and *Albizzia*[2] sp. are fairly common at present, while *Dendrocalamus*[3] is of somewhat sporadic and limited distribution. Here, it may, be of interest to record that while the charcoal-pieces of *Albizzia* sp. closely agree with *gorad* (*Albizzia odoratissima*), the common present species, the bamboo-remains match more closely with *Dendrocalamus longispathus* which at present is confined to north-eastern part of India, than with *tokar* (*Dendrocalamus strictus*), the bamboo now occurring in the region.

From a comparative study of the past flora, as revealed by the plant-remains and the present vegetation, it seems reasonable to conclude that the forest-cover of the region on the whole has remained more or less of the same type. The floristic composition indicated by the charcoal-determinations is generally characteristic of what Champion[4] has classified and described as dry teak forest type under the southern dry deciduous group. The most characteristic tree of the type is *Tectona grandis*, and its most typical associates are *Anogeissus latifolia* and *Terminalia*. The chief bamboo is *Dendrocalamus*. The dry deciduous teak forest may often merge into the thorn forest wherever the rainfall drops below 75 cm. The abundant occurrence of *Acacia* sp. in association with teak in the charcoal-material from Prakash excavations is, therefore, suggestive. Taking all these factors into consideration, it would not be far wrong in assuming that the climate and rainfall in the Khandesh region of Maharashtra have not changed to any appreciable extent during the last three thousand five hundred years or so.

As the plant-material available for study was entirely in the form of charcoal, we can at best only speculate on the probable uses to which the woods of the several species identified might have been put by the inhabitants of the region during the different occupational periods. It is not even clear whether the woods were originally utilized as charcoal or in any other form. *Anogeissus* and *Acacia* yield excellent charcoal[5] and their use as fuel, therefore, was only to be expected. Practically all the species identified are common, useful and commercially important timbers of modern times.[6] *Tectona grandis* and *Dalbergia latifolia* are the most outstanding, being known all over the world. *Acacia*, *Terminalia*, *Anogeissus* and *Albizzia* also provide useful timbers for general construction, furniture and agricultural implements. It is, therefore, conceivable that they might well have been used for house-building, ploughs, carts, etc., even during the second millennium B.C., by the early settlers of Prakash. *Kura* (*Holarrhena antidysenterica*) is an even and fine-textured wood, eminently suitable for turnery and carving and might have been used for some kind of kitchen-ware or toys. Here, it may not perhaps be out of place to refer to the curious absence in charcoal-remains of *salai* (*Boswellia serrata*), the present most common species of the region. In view of the close similarity in vegetation and climate between now and three thousand five hundred years ago, the only inference that could possibly be drawn is that this wood, though it might have been abundant, was not used for any purpose. This is by no means so remarkable as it may first appear, considering that

[1] Osmaston, *op. cit.*, p. 43.

[2] *Ibid.*, p. 42.

[3] *Ibid.*, p. 9.

[4] H. G. Champion, 'A preliminary survey of forest types of India and Burma', *Indian For. Rec.*, N. S., I, no. 1 (1936).

[5] J. S. Gamble, *A Manual of Indian Timbers* (London, 1922).

[6] H. Trotter, *The Common Commercial Timbers of India and Their Uses* (Dehra Dun, 1944); R. S. Pearson and H. P. Brown, *Commercial Timbers of India* (Calcutta, 1932).

as recently as the beginning of the present century there was next to no demand for *salai* by the local population of West Khandesh Division as it was looked down as a useless timber, unfit even for fuel.[1]

F. Summary

1. Charcoal-remains collected from the archaeological excavation at Prakash in West Khandesh, Maharashtra, have been examined.

2. The charcoal-specimens belong to the first three occupational periods ranging from *circa* 1700 B.C. to the end of the sixth century A.D. No charcoal specimen was sent from Period IV.

3. Altogether seven different types of wood, viz. *Tectona grandis*, *Acacia* sp., *Anogeissus* sp., *Dalbergia latifolia*, *Terminalia* sp., *Halarrhena antidysenterica*, *Albizzia* sp. and one bamboo—*Dendrocalamus* sp.—have been identified.

4. The significance of the occurrence of the different species in the charcoal-remains has been discussed in the light of the present-day flora of the region.

EXPLANATION OF PLATES

Pl. XXXV

Tectona grandis Linn. f.

1. Transverse section of charcoal showing typical ring-porous character and *parenchyma* (mostly collapsed) embedding early wood vessels (× 43).

2. Tangential section of charcoal showing ray size, structure and arrangement (× 60).

Acacia sp.

3. Transverse section of charcoal showing mostly solitary vessels and predominantly vasicentric *parenchyma* (× 43).

4. Tangential section of charcoal showing multiseriate homocellular rays (× 43).

Pl. XXXVI

Anogeissus sp.

1. Transverse section of charcoal showing growth-ring demarcated by fibrous zone with fewer vessels (× 43).

2. Tangential section of charcoal showing uniseriate heterocellular ryas (× 135).

Dalbergia latifolia Roxb.

3. Transverse section of charcoal showing aliform to aliform confluent *parenchyma* and fine rays (× 43).

4. Transverse section of another specimen showing scanty vessels and *parenchyma* forming thin wavy bands (× 43).

5. Tangential section of charcoal showing size, frequency and arrangement of rays (× 60).

[1] Osmaston, *op. cit.*, p. 15.

6. Highly-magnified tangential section of charcoal showing the 1 to 2 seriate rays arranged in three distinct storeys (× 135).

Pl. XXXVII

Terminalia sp.

1. Transverse section of charcoal showing large vessels, aliform *parenchyma* and fine rays (× 60).

2. Tangential section of charcoal showing numerous uniseriate rays (× 60).

3. Highly-magnified tangential section showing almost homocellular rays (× 135).

Holarrhena antidysenterica R. Br.

4. Transverse section of charcoal showing distribution and arrangement of numerous small vessels (× 43).

5. Tangential section of charcoal showing ray distribution (× 60).

Pl. XXXVIII

Albizzia sp.

1. Transverse section of charcoal showing predominantly aliform *parenchyma* (× 60).

2. Tangential section of charcoal showing ray distribution (× 60).

Dendrocalamus sp.

3. Transverse section of charcoal showing typical structure of the vascular bundles (× 135).

4. Longitudinal section of charcoal showing the characteristic shape of the *parenchymatous* cells of the ground tissue (× 200).

APPENDIX

CARBON-14 DATES FROM THE SITES MENTIONED IN THE REPORT

NAVDATOLI SERIES

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station Index no.	Published references	Remarks
Charcoal	Near 'S' section; 2·03 m. below surface	Earliest floor of Phase I	1610±70 B.C.	P-475	Robert Stuckenrath Jr., 'University of Pennsylvania radiocarbon dates VI', *Radiocarbon*, 5 (1963), p. 93	—
,,	Trench II; sub. sq. W; layer 8	Early level of Phase I	1610±130 B.C.	P-200	Elizabeth K. Ralph, 'University of Pennsylvania radiocarbon dates III', *American Journal of Science, Radiocarbon Supplement*, 1 (1959), p. 53	—
,,	Trench II; sub. sq. D; layer 8	,,	1645±130 B.C.	P-201	,,	—
,,	Trench I, A-1; 2·75 m. below surface; stratum 9	Late level of Phase I	1530±110 B.C.	TF-59	S. Kusumgar, D Lal and R. P. Sarna, 'Tata Institute radiocarbon date list I', *Radiocarbon*, 5 (1963) p. 280	Traces of rootlets present; collected after two years when the trench sides had collapsed; possibility of contamination

Charcoal (from remains of burnt wooden post in red débris)	Trench I, A. 17; 1·27 m. below surface; layer 7	Mid-level of Phase II	2300±70 B.C.	P-476	Stuckenrath Jr., *op. cit.*, p. 93	—
Charcoal	Trench I, sub-sq. A-18; layer 6	Late level of Phase II	1660±130 B.C.	P-202	Ralph, *op. cit.*, p. 52	—
"	Trench I, sub-sq. G; layer 3	Late level of Phase III	1600±130 B.C.	P-204	"	—
Burnt wheat	Trench I, sub-sq. M; layer 2	Early level of Phase IV	1440±130 B.C.	P-205	"	—
NEVASA SERIES						
Dry clean charcoal (wood)	Trench H, locus MD 1; 1·42 m. below datum i.e. 6·90 m. below surface; layer 11	Late level of Period III Chalcolithic	1250±125 B.C.	P-181	Ralph, *op. cit.*, p. 52	—
Charcoal	Trench no. 181, B, N. section; 1·34 m. below surface; layer 5	"	1255±115 B.C.	TF-40	Kusumgar *et al.*, *op. cit.*, p. 278	—
Charred wood	Trench F, locus MD1; 1·19 m. below datum i.e. 6·70 m. below surface; in the flooring sealed by layer 10, layer 11	"	670±120 B.C.	P-184	Ralph, *op. cit.*, p. 52	Bottom of the shipping container was broken when received in the Lab.; possibility of contamination with modern sawdust.

NEVASA SERIES (Contd.)

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station Index no.	Published references	Remarks
Charred grain (*bājrī*, a millet)	Trench H; 4·57 m. below surface; soak pit no. 4	Period IV, Sātavāhana Period	A.D. 50±110	P-183	Ralph, *op. cit.*, p. 52	On the evidence of coins and of imported pottery from the pit, the level can be dated in the range of 250 B.C. to A.D. 150.
Charcoal in the form of charred grain (mixed with soil)	Trench 180 B; ·15 m. below surface; layer 4	Period IV-V, Indo-Roman	A.D. 145±110	TF-38	Kusumgar *et al.*, *op. cit.*, p. 278	Traces of rootlets were available
Charred grains (mixed with little soil)	Trench 14 B; layer 2	Period IV, Early Historic	A.D. 225±100	TF-41	,,	Dated to *circa* 150 B.C. to 50 B.C. with the help of coins and ceramics
Charred grains (with little mud)	Trench 101 B; ·56 m. below surface; layer 4 (disturbed by pits)	Period IV, Early Historic	A.D. 35±105	TF-39	,,	Some visible rootlets were present

CHANDOLI SERIES

Charcoal	Trench 7; ·83 m. below surface; layer 2	Early level of Period I, Chalcolithic	1330 ± 70 B.C.	P-473	Stuckenrath Jr., *op. cit.*, p. 92	—
,,	Trench 8; ·88 m. below surface; layer 2	,,	1300 ± 70 B.C.	P-472	,,	—
,,	Trench 9; ·76 m. below surface; layer 2	,,	1240 ± 190 B.C.	P-474	,,	—
Charcoal (mixed with soil)	Trench 2; ·5 m. below datum; layer 2	,,	1175 ± 120 B.C.	TF-42	Kusumgar *et al.*, *op. cit.*, p. 280	A few rootlets were present
Charcoal (with some mud)	Trench 8; ·86 m. below datum; layer 2	,,	1040 ± 105 B.C.	TF-43	Kusumgar *et al.*, *op. cit.*, p. 279	,,

AHAR SERIES

Charcoal (with little soil)	Trench E; 11·5 m. below datum; layer 7	Mid-level of Sub-period IA	1725 ± 140 B.C.	TF-34	Kusumgar *et al.*, *op. cit.*, p. 276	—
Charcoal (mixed with little mud and dirt)	Trench J; 12·1 m. below datum; layer 8	Mid-level of Sub-period IA	1310 ± 115 B.C.	TF-37	,,	The sample was expected to be older than TF-34, being from a lower layer, possibly disturbed
Very soft charcoal (mixed with little mud)	Trench A; 4·9 m. below datum; layer 5	Mid-level of Sub-period IC	1550 ± 110 B.C.	TF-32	,,	Some visible rootlets were present in the sample

AHAR SERIES (Contd.)

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station Index no.	Published references	Remarks
Charcoal (mixed with little mud)	Trench X; 1·98 m. below datum; layer 5	Late level of Sub-period IC	1275 ± 110 B.C.	TF-31	Kusumgar *et al.*, *op. cit.*, p. 276	—
Charcoal (mixed with some mud)	Trench H; ·15 m. below surface; layer 1	Late medieval culture	A.D. 1755 ± 90	TF-18	,,	Traces of rootlets were present; presence of polychrome glass bangles and Muslim burials confirms the date and indicates reoccupation of the site after the 14th-15th century A.D.

ERAN SERIES

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station Index no.	Published references	Remarks
Charcoal and clay	Exten. B; 3·70 to 3·75 m. below surface; layer 4	Early level of Period I	2035 ± 75 B.C.	P-529	Stuckenrath Jr., *op. cit.*, p. 93	—
,,	ERN-7, XVII-XIV; 7·31 to 7·51 m. below surface; layer 20	Mid-level of Period I	1015 ± 65 B.C.	P-528	,,	Sample was very damp; mole growing on one portion was removed before pre-treatment

Charcoal and clay	ERN-2C; 5·23 m. below surface; layer 15	Late level of Period I	1340±70 B.C.	P-525	Stuckenrath Jr., *op. cit.*, p. 93	—
,,	ERN-7, XIII-XVI; 6·01 to 6·27 m. below Surface; layer 18 C	,,	1280±70 B.C.	P-526	,,	—
,,	ERN-7, XIII-XIV; 6·78 to 6·88 m. below surface; layer 19	,,	640±60 B.C.	P-527	,,	—
LOTHAL SERIES						
Charcoal powder (mixed with earth)	SRG-2, A×33; 3·0 m. below surface; layer 10	Period A, late levels of Phase I	2080±135 B.C.	TF-136	D.P. Agrawal, S. Kusumgar and R. P. Sarna, 'Radiocarbon dates of archaeological samples', *Current Science*, 33, no. 9 (May 1964), p. 269	Probability of contamination by younger carbon is greater
,,	SRG-2, A×33; 2·5 m. below surface; layer 9	Period A, early level of Phase II	1555±130 B.C.	TF-135	,,	,,
,,	SRG-2, A×33; 1·37 m. below surface; layer 6	Period A, late level of Phase II	1895±115 B.C.	TF-133	,,	,,
Charcoal powder (mixed with mud and dirt)	SRG-2, D13/7A; 1·98 m. below surface; from flood débris, loam, etc., accumulated against wall of III B	Period A, Phase III B	2005±115 B.C.	TF-27	Kusumgar *et al.*, *op. cit.*, p. 277	—

LOTHAL SERIES (Contd.)

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station index no.	Published references	Remarks
Charcoal, (coarse with fine grain)	SRG-2, D13/7A; 1·98 to 2·26 m. below surface; same deposit as above	Period A, Phase III B	1995±125 B.C.	TF-26	Kusumgar *et al.*, *op. cit.*, p. 277	—
Charcoal (mixed with soil)	SRG-2, E13/9; 1·88 m. below surface; sealing wall of Phase III	Period A, end of Phase III B	2010±115 B.C.	TF-22	,,	—
Charcoal (mixed with little mud and dirt)	SRG-55, XII-XVIII/7; 2·11 m. below surface	Period A, Phase IV A	1900±115 B.C.	TF-29	,,	Sample is from the water logged débris of a cesspool in which sullage water probably accumulated
Charcoal (mixed with mud and dirt)	SRG-54, XLIII-XLVIII/4; 1·22 m. below surface	Period B, Phase V A, from a post-hole of mud wall of Phase V A, built on flood débris of Phase IV	1865±110 B.C.	TF-23	,,	—
Charcoal (mixed with mud and dirt)	SRG-11, 5B; 2·19 to 2·25 m. below surface	Period B Phase V A, from the débris sealing the western embankment wall of the dockyard	1810±140 B.C.	TF-19	,,	—

RAJGIR SERIES

Charcoal, part of the burnt building material	VI-0 m. S × 1·02 m. E; 8·7 m. below surface; from a cutting across the southern defences near SW corner bastion; found in pit 3, cut into layer 5 and filled with ashy materials of layer 4, below rampart	I, pre-defence (the earliest occurrence of the N. B. P. Ware at the site)	245 ± 105 B.C.	TF-46	Kusumgar *et al.*, *op. cit.*, p. 280	—
Charcoal (coated with little mud), part of the burnt building material	VII-IX; 7·05 m. below surface; from a cutting across the southern defences near SW corner bastion; found in layer 4 below the mud rampart	I, pre-defence N. B. P. ware deposit	245 ± 105 B.C.	TF-45	Kusumgar *et al.*, *op. cit.*, p. 281	—

HASTINĀPURA SERIES

Charcoal (mixed with earth)	HST-1/1962, XC-XCIV; 7·25 to 7·45 m. below surface; layer 28 and pit Z, sealed by layer 27	Late level of Period II	505 ± 130 B.C.	TF-85	D. P. Agrawal, S. Kusumgar and R. P. Sarna, 'Radiocarbon dates of archaeological samples' *Current Science*, 33, no. 2 (Jan. 1964), p. 41; D. P. Agrawal, S. Kusumgar, D. Lal and R. P. Sarna, 'Tata Institute radiocarbon date list II', *Radiocarbon*, 6 (1964), pp. 227-28	A few rootlets were present

Hastināpura Series (Contd.)

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station index no.	Published references	Remarks
Charcoal (mixed with earth)	HST-1/1962, XC-IV-XCVII; 6·9 m. below surface; layer 27	Late level of Period II	570±125 B.C.	TF-91	Agrawal *et al.*, *op. cit.* (May 1964), p. 267; *Radiocarbon*, 6 (1964), pp. 227-28	A few rootlets were present
Bone (coated with earth)	HST-1/1962, XC-XCVII; 6·8 m. below surface; layer 26 and pit Y sealed by layer 25	Latest layer of Period II	375±100 B.C.	TF-112	"	"
Charcoal (mixed with earth)	HST-1/1962, XC-IV-XCVII; 6·6 m. below surface; layer 26	Uppermost level of Period II (marking the end of the Painted Grey Ware)	385±110 B.C.	TF-90	Agrawal *et al.*, *op. cit.* (Jan. 1964), p. 41; *Radiocarbon*, 6 (1964), pp. 227-28	—
Charcoal (mixed with earth)	HST-1/1962, XC-IV-XCVII; 6·75 m. below surface; layer 26, pit Y sealed by 25	Upper-most level of Period II (marking the end of the Painted Grey Ware)	335±110 B.C.	TF-83	"	A few rootlets were present
Charcoal (mixed with earth)	HST-1/1962, XC-IV - XCVII; 6·45 m. below surface; layer 25	Lowest level of Period III (beginning of the N.B.P. Ware)	340±110 B.C.	TF-88	"	"

Charcoal (mixed with earth)	HST-1/1962, North Ext. G-H; 3·9 m. below surface; layer 23	End of Period III	50±110 B.C.	TF-80 and TF-82	Agrawal *et. al.*, *op. cit.* (Jan. 1964), p. 41; *Radiocarbon*, 6 (1964), pp. 227-28	—
Charcoal (mixed with earth)	HST-1/1962, XC-XCIV; 5·1 m. below surface; layer 18	Uppermost layer of Period III (marking the end of the N. B. P. Ware)	125±100 B.C.	TF-81	Agrawal *et al.*, *op. cit.* (May 1964), p. 267; *Radiocarbon*, 6 (1964), pp. 227-28	A few rootlets were present

ATRANJIKHERA SERIES

Charcoal (*mixed with* earth)	ARJ-4, D1; top of south-west corner; 3·20 m. below surface; layer 6	Earliest level of the *Painted* Grey Ware	1025±110 B.C.	TF-191	Agrawal *et al.*, *op. cit.* (*May 1964*), p. 267	—
Charcoal	ARJ-4, *D1* (SE); 2·5 m. below surface; *layer 6*	*Painted* Grey Ware deposit	535±*100* B.C.	TF-291	D.P. Agrawal, Sheela Kusumgar and M. Unni Krishnan, 'Radiocarbon dates of samples from N.B.P. ware and pre N.B.P. ware levels', *Current Science*, 35, no. 1 (January 1966)	—
,,	ARJ-4, A1 (NW); 3·1 m. below surface; layer 16	N. B. P. Ware deposit	530±85 B.C.	TF-194		
,,	ARJ-4, A1 (SW); 5 m. below surface; layer 29	,,	295±100 B.C.	TF-284	,,	
,,	ARJ-4, A1 (NE); 4·85 m. below surface; layer 27	,,	260±105 B.C.	TF-283	,,	

KAUŚĀMBĪ SERIES

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station index no.	Published references	Remarks
Charcoal	KSB-1-III,-RD, 5-7; 4·3 m. below surface; pit B sealed by layer 12	Period III, N.B. P. Ware phase	500±105 B.C.	TF-221	D.P. Agrawal, Sheela Kusumgar and D. Lal, 'The measurement of radiocarbon activity and some determinations of ages of archaeological samples', *Current Science*, 34, no. 13 (July 1965), p. 5	—
,,	KSB-GR, YZ-3, 1-2; 1·6 m. below surface; layer II	Period III, early levels of the N. B. P. Ware phase	400±110 B.C.	TF-225	,,	—
,,	KSB-1-III,-RD, 2-7; 3 m. below surface; Road I	Period III, mid-level of the N.B. P. Ware phase	440±100 B.C.	TF-219	,,	—
,,	KSB-GR, YZ-2, 2-3; 3 m. below surface; pit C sealed by layer 18 ABK	Period III, N.B. P. Ware phase	410±110 B.C.	TF-103	D.P. Agrawal and S. Kusumgar, 'Radiocarbon dates of some neolithic and early historic samples', *Current Science*, 34, no. 2 (Jan. 1965), p. 43	A few rootlets were visible in the sample

Charcoal	KSB-GR, YZ-2, 2-3; 2·4 m. below surface; layer 22 BK	Period III, N.B. P. Ware phase	270±110 B.C.	TF-104	Agrawal *et al.*, *op. cit.* (Jan. 1965), p. 43	A few rootlets were present
,,	KSB-GR, YZ-2, 1-2; 2·39 m. below surface; pit A sealed by layer 21 BK	,,	335±115 B.C.	TF-105	,,	,,
,,	KSB-GR, YZ-3, 1-2; 0·3 m. below surface; layer 12	Period III (Rampart II), N.B. P. Ware phase	220±100 B.C.	TF-226	Agrawal *et al.*, *op. cit.* (July 1965), p. 4	—
Charcoal (mixed with earth)	KSB-GR, YZ-2, 1-2; 2·15 m. below surface; pit A sealed by layer 18 A	Period III, N.B. P. Ware phase	275±100 B.C.	TF-100	Agrawal *et al.*, *op. cit.* (May 1964), p. 268; *Radiocarbon*, 6 (1964), pp. 230-31	A few rootlets were visible in the sample
,,	KSB-1- III, RD, 4-6; 2·03 m. below surface; Road IV	Period IV	115±100 B.C.	TF-96	,,	,,
,,	KSB-1- III, RD, 4-5; 1·33 m. below surface; Road VI	Period IV	50± 95 B.C.	TF-94	,,	,,
,,	KSB-1- III, RD, 4-6; 1·44 m. below surface; Road V	Period IV	A.D. 50±120	TF-95	,,	,,
,,	KSB-I- III, RD, 3-5; 1·25 m. below surface; layer 4	Period IV	A.D. 245±110	TF-93	Agrawal *et al.*, *op. cit.* (Jan. 1964), p. 42; *Radiocarbon*, 6 (1964), pp. 230-31	,,
,,	KSB-I-III, RD, 2-5; 1·65 to 1·70 m. below surface; layer 6	,,	A.D. 260±110	TF-97	,,	,,

KAUŚĀMBĪ SERIES (Contd.)

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station index no.	Published references	Remarks
Charcoal (mixed with earth)	KSB-GR, E6, XXXIII-XXXIV; 1·25 m. below surface; pit sealed by layer 2	Period IV (from the débris of Hūṇa invasion)	A.D. 435±95	TF-98	Agrawal *et al.*, *op. cit.* (May 1964), p. 268; *Radiocarbon*, 6 (1964), pp. 230-31	A few rootlets were visible in the sample

HETIMPUR SERIES

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station index no.	Published references	Remarks
Charcoal	HPR-1 A-2, IX-XIV; ·46 m. below surface; layer 4	N. B. P. Ware phase	105±105 B.C.	TF-176	Agrawal *et al.*, *op. cit.* (Jan. 1965), p. 42	—
”	HPR-1(V), A-2, XII-XIII; 1·2 m. below surface; pit B sealed by 4	”	A.D. 80±105	TF-177	”	—

RUPAR SERIES

Material	Locus	Period	C-14 determination, calculated at 5730 years as half-life value	Lab. or station index no.	Published references	Remarks
Charcoal	RPR-2, X'-XI'; 11·4 m. below surface; layer 30	Early level of Period III, N. B. P. Ware phase	485±100 B.C.	TF-209	Agrawal *et al.*, *op. cit.* (July 1965), p. 5	—
Charred wood	RPR-1, O-VIII; layer 26	N. B. P. Ware deposits	390±105 B.C.	TF-213	Agrawal *et al.*, *op. cit.* (January 1966)	—

BESNAGAR SERIES

Charcoal	BSN-1; 2·70 m. below surface; layer 8	Early phase of the N.B.P. Ware	295±110 B.C.	TF-254	Agrawal *et. al.*, *op. cit.* (July 1965), p. 5	—

RAJGHAT SERIES

Charcoal	RGT-XI, XI-XII; 9·45 m. below surface; layer 11.	Early phase of the N. B. P. Ware	490±110 B.C.	TF-293	Agrawal *et al.*, *op. cit.* (January 1966)	—

AHICHCHHATRA SERIES

Charcoal	High Mound, IX'-X'; 3·8 m. below surface; pit 5 sealed by layer 14	Overlapped deposit yielding Painted Grey and N.B. P. Wares	475±105 B.C.	TF-311	"	
"	High Mound, XI-XII; 2·5 m. below surface; pit 4 sealed by layer 8 A	N. B. P. Ware deposit	160±95 B.C.	TF-310	"	

BEGINNINGS OF SCULPTURAL ART IN SOUTH-EAST INDIA : A STELE FROM AMARAVATI

By A. Ghosh & H. Sarkar

CONTENTS

1. INTRODUCTION

THE STELE DESCRIBED AND ILLUSTRATED HERE WAS DISCOVERED AT THE FAMOUS *stūpa*-site of Amaravati (lat. 16° 34′ N.; long. 80° 17′ E.), District Guntur, Andhra Pradesh, in the course of clearance, mostly around the *stūpa*, undertaken by Dr. R. Subrahmanyam, Superintendent, Archaeological Survey of India, and his staff in the year 1958-59.[1] The operation uncovered many unknown features of the *stūpa* and brought to light a large number of loose sculptures and architectural fragments, including uprights and cross-bars of more than one railing, many of them bearing donative inscriptions in characters of the second century B.C. and later,[2] which are under study and will be published in due course. These finds, together with the inscriptions published earlier,[3] bespeak a

[1] The results have been briefly noticed in *Indian Archaeology 1958-59—A Review* (New Delhi, 1959), p. 5.

[2] Many of these inscriptions have been noticed in *Annual Report on Indian Epigraphy 1959-60* (Delhi, 1963), pp. 47-50. Some of those on the present stele appear on p. 50 as nos. 54 to 57.

[3] *Epigraphia Indica*, XV (1925), pp. 258-75; C. Sivaramamurti, *Amaravati Sculptures in the Madras Government Museum* (Madras, 1956), pp. 271-304.

pre-Christian origin of the *stūpa*, and the recently-discovered pillar-fragment with a Mauryan, almost certainly Aśokan, inscription on it[1] tends to point to Aśoka as the author of the nucleus of the *stūpa*, which underwent additions and embellishments during the next five centuries or so. All this makes it difficult to accept Barrett's 'short chronology' for the *stūpa* (second century and first half of third century A.D.).[2] In bulk, the discoveries are of value for the reconstruction of the history of the *stūpa*; taken singly, the present stele is the most important of them because of the early sculptures and inscriptions it bears and therefore deserves separate publication.

The position of the stele in the architectural scheme of the *stūpa* is not known.

2. PHYSICAL FEATURES OF THE STELE

The stele[3] (pl. XXXIX) is of greenish limestone, known as Palnad marble, which is the material of all Amaravati and Nagarjunakonda sculptures. Its top is missing and so is one of its sculptured faces, which has obliquely broken off, giving its upper part a triangular profile when viewed from two sides (cf. pls. XL and XLII). While its original dimensions are thus not available, its maximum extant height is 1·84 m., including the lower undressed part (98 cm.). To judge from its second face, which is largely intact horizontally, it was 52 cm. square.

3. THE SCULPTURES AND INSCRIPTIONS

A. General observations

The three extant faces of the stele depict Buddhist scenes, almost all of them bearing inscribed explanatory labels; there is no means of knowing what was the subject-matter of the fourth face. A three-barred railing ran at the base of the finished part of the stele all round, and the sculptured part, as can be guessed from the second face, was framed by a double row of bead-and-reel border separated from each other by a plain strip.

We shall now proceed to describe the sculptures and inscriptions on each face. The faces have been numbered first, second, third and fourth (the last missing) in a clockwise direction.

B. First face: from Vaiśālī to Kuśīnagara (pl. XL)

(i) *The biographical background*

The sculptures and inscriptions on the first face are the most interesting and pertain to the last three months of the life of Buddha, from his stay at Vaiśālī to the *parinirvāṇa* at

[1] *Epigraphia Indica*, XXXV (1962), pp. 40-43.

[2] Douglas Barrett, *Sculptures from Amaravati in the British Museum* (London, 1954), pp. 40 ff. Philippe Stern and Mireille Bénisti recognize four phases in the Amaravati art, ranging in time from between Bharhut-Sanchi on the one hand and Nagarjunakonda on the other, *Évolution du Style Indien d'Amarāvatī* (Paris, 1961), and this is not inconsistent with the now-available evidence derived from railing-architecture and inscriptions.

[3] Along with other recent finds, the stele is housed in the local Archaeological Museum of the Archaeological Survey of India and bears field no. 304 and accession no. 441-1.

Kuśīnagara, depicted chronologically from the bottom upwards. To understand their full import it is desirable to recall a few relevant happenings in Buddha's life during the period, as recorded in the *Mahā-parinivvāna-suttanta*.[1]

Buddha arrived from Nāḍikā at Vaiśālī where he resided in Āmrapālī's grove. Thence he shifted himself to Beḷuva near Vaiśālī but returned to the latter place, where he stayed this time at Chāpāla-chaitya.[2] There Māra called on him and asked him to pass away, and Buddha informed Māra that he would die within three months. Relating this incident to Ānanda, Buddha added: 'Thus, Ānanda, the Tathāgata has today at Chāpāla-chaitya consciously and deliberately rejected the rest of his allotted term of life.'[3]

From Chāpāla-chaitya Buddha resorted to Mahāvana-kūṭāgāra.[4] One day he entered Vaiśālī for alms; before leaving the place he gazed at it 'with an elephant's look' and said to Ānanda that that was going to be his last look at Vaiśālī.[5]

From Vaiśālī Buddha and his disciples proceeded to Pāvā, visiting many places on the way. At Pāvā he partook of the meals offered to him by the smith Chunda, which made him fall sick on his way to Kuśīnagara. He went aside from the path to the foot of a tree, where Ānanda prepared a seat out of a four-folded *saṅghāṭī* for him to rest on. He wanted to drink water, but as the adjoining streamlet was dirty, five hundred carts having crossed it just then, Ānanda requested him to walk over to the river Kakutthā to get pure water. But on Buddha's insistence Ānanda went to fetch water from the muddy streamlet, and lo! the streamlet began to flow clear. Ānanda took water in a bowl and Buddha quenched his thirst. From his seat Buddha converted a young Malla called Pukkasa, a disciple of Āḷāra Kālāma, who presented to Buddha a pair of robes of cloth of golden hue.[6]

Buddha and his party then walked over to the Kakutthā, where Buddha bathed and drank water. He was tired when he crossed the river and his disciple Chundaka made a seat for him out of the robe given by Pukkasa.[7] Thereafter the last stretch of the track was covered and Buddha reached Kuśīnagara on the other side of the Hiraṇyavatī. As is well-known, he attained *parinirvāṇa* there.

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[1] Text: *Dīgha-Nikāya*, ed. T.W. Rhys Davids and J. Estlin Carpenter, Pali Text Society (P.T.S.), II, (London, 1903), pp. 72-168; Translation: T. W. Rhys Davids, *Buddhist Suttas*, Sacred Books of the East, XI (Oxford, 1881), pp. 1-136. Referred to below as Text and Translation respectively. The Pāli words have been Sanskritized as far as possible.

[2] Chāpāla-chaitya is enumerated by Buddha as one of the beautiful spots of Vaiśālī : Text, p. 102; Translation, p. 40; *Saṁyutta-Nikāya*, V, *Mahāvagga*, ed. M.Leon Feer, P.T.S. (London, 1898), p. 259; *Aṅguttara-Nikāya*, IV, ed. E. Hardy, P.T.S. (London, 1899), p. 309.

[3] Text, p. 114: *Idān' eva kho Ānanda ajja Chāpāle chetiye Tathāgatena satena sampajānena āyu-saṁkhāro ossaṭṭho' ti*; Translation p. 54. Important from our point of view is the word *ossaṭṭho* (Sanskrit *av-ot-sṛishṭa*), 'rejected', 'renounced', a variant of which occurs in our Inscription B (below, p. 171). This incident was regarded as one of the great events in Buddha's life, as it is ranked with his Birth, Enlightenment, First Sermon and Death in the *Kathā-vatthu*, ed. Arnold C. Taylor, P.T.S,. II (London, 1897), p. 559, where the word in question is repeated: *Chāpāle chetiye āyu-saṁkhāro ossaṭṭho*. The Māra incident is related in slightly varying versions by Fa-Hien and Hiuen Tsang, Samuel Beal, *Buddhist Records of the Western World* (London, 1906), I, pp. liii-liv, and II, pp. 69-71.

[4] Text, p. 119; Translation, p. 59.

[5] Text, p. 122: *nāg-āpalokitaṁ Vesālim apaloketvā āyasmantaṁ Ānandaṁ āmantesi: idaṁ pachchhi-makaṁ Ānanda Tathāgatassa Vesāli-dassanaṁ bhavissati*; Translation, p. 64. Note the word *nāg-āpaloki-taṁ*, which is echoed in our Inscription C (below, p. 172).

[6] Text, pp. 128-33; Translation, pp. 73-80.

[7] Text, pp. 134-35; Translation, pp. 82-83.

After this somewhat long but necessary digression we return to the stele.

(ii) *First scene: Bahuputra-chaitya*

Description.—The first scene occupies the lower part of the left corner (dexter of the stele), where stand three trees. The bases of two of them are each enclosed by a three-barred railing. The one to the right, the most prominent of the three, is worshipped by two devotees, one of them with folded hands and the other holding a child in the outstretched left hand. Each wears long hair, a three-stringed beaded girdle and a *dhotī*, the folds of which are indicated by curly lines. The inscription below, in two lines, reads :

Inscription A (pl. XLIII A).—(L. 1) *Bahu'puta-chetiya Vesālakāni* (l. 2) *chetiyāni*.[1]

'Bahuputra-chaitya (and) the *chaityas* of Vaiśālī.'

Comments.—The word *chaitya* here no doubt means a 'sacred tree'. Though the *Mahā-parinivvāna-suttanta* does not mention Bahuputra-chaitya as one of the places resided at by Buddha during his last visit to Vaiśālī, it had been one of his favourite resorts during his previous stays.[2] According to Buddhaghosha, there was here a many-branched tree where people prayed for sons;[3] that would explain why one of the devotees holds out a child towards the tree.

The words *Vesālakāni chetiyāni* may be regarded as a general label for the scene.

(iii) *Second scene: Chāpāla-chaitya*

Description.—To the right of the first scene (sinister side of the stele) is a kneeling figure with folded hands before a pair of feet (*Buddha-pāda*) placed on a low pedestal, over which is the fragment of a rectangular object. The person has a grotesque face and a knobbed head-dress; his *dhotī* is indicated by oblique parallel lines. The inscription below runs as follows :

Inscription B (pl. XLIII B).—*Chāpāla-chetiya Mārō yāchate osaṭh-ita(ti)*.

'In Chāpāla-chaitya Māra begs renunciation (of life).'

Comments.—The story of Māra exhorting Buddha to die and its importance have been related above (p. 170). The worshipper here may represent Māra. *Osaṭha* is no doubt the same word as Pāli *ossaṭṭha* (above, p. 170, n. 3).[4] Buddhaghosha says that Chāpāla-chaitya was once the residence of the *yaksha* Chāpāla, but a *vihāra* was erected here for Buddha.[5] It is referred to in the *Divyāvadāna*.[6] Fa-Hien mentions it as the *stūpa* of deposited bow (cf. *chāpa*) and clubs; Hiuen Tsang also saw a *stūpa* there.[7]

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[1] The letter *hu* is malformed.

[2] Cf. Text, pp. 102 and 118; Translation, pp. 40 and 58. It is called Bahupatraka in the *Divyāvadāna* (Darbhanga, 1959), p. 125.

[3] G. P. Malalasekera, *Dictionary of Pāli Proper Names* (London, 1960), II, p. 273, quoting the *Udāna Commentary*, p. 323, and the *Sāratthappakāsinī*, II, p. 128 (references not checked by us).

[4] But while *ossaṭṭha* is a passive past participle, that form is not grammatically justified here.

[5] Malalasekera, *op. cit.*, I, p. 863, quoting the *Udāna Commentary*, pp. 322 f. (reference not checked by us).

[6] *Divyāvadāna*, pp. 125 and 128.

[7] Beal, *op. cit.*, I, p. liii, and II, p. 69.

(iv) *Third scene: Mahāvana-kūṭāgāra-śālā*

DESCRIPTION.—Over the human figure of the second scene is the *chaitya*-arched entrance, frontally depicted, of a structure with a roof of the shape of a three-pinnacled vault. Through the door is seen a shrine, the curved roof of which is marked with oblique and vertical straight lines as if representing its bamboo-frame. Inside, at the bottom, is a pair of *Buddha-pāda* over which is a throne, its front with a beaded border, surmounted by an umbrella. There is a two-line inscription in the left upper corner over the roof-vault:

INSCRIPTION C (pl. XLIII C).—(L. 1) [*Vesa*]*liya*(*ye*) *viharati Mahāvane kuḍāgā*[*ra*]-(l. 2) [*sā*]*lāya*.[1]

'(The Lord) dwells in the *kūṭāgāra*-cottage in Mahāvana at Vaiśālī.'[2]

COMMENTS.—As stated above (p. 170), Buddha went from Chāpāla-chaitya to Māhāvana-kūṭāgāra, depicted here. According to Buddhaghosha the pinnacled *śālā* stood on pillars. The whole *saṅghārāma* came to be known as *kūṭāgāra-śālā* after it.[3] Fa-Hien saw a two-storeyed *stūpa* here.[4]

(v) *Fourth scene: the 'elephant's look'*

INSCRIPTION D (pl. XLIII D).—Over the figure holding a child in the first scene occurs the following inscription: *nāg-ā*[*pa*][5]*logana*.

'The elephant's look.'

COMMENTS.—This represents the site of the last look of Buddha at Vaiśālī, *nāg-āpalogana* of our inscription corresponding to *nāg-āpalokita* of the Pāli text (above, p. 170, n. 5). Both Fa-Hien and Hiuen Tsang saw a *stūpa* on the spot.[6]

(vi) *Fifth scene: the miracle of clear water*

DESCRIPTION.—Going further up, over Inscription D, we see the depiction of flowing waters with a handled bowl over it. Beside is an oblong seat below a tree, with a second tree to its left. An indistinct object, perhaps an aquatic animal, is seen in the waters at the right edge.

COMMENTS.—In the absence of any explanatory label, which might have existed in the now-missing right-hand portion, the stream has to be identified with any one of the three crossed by Buddha on his way from Vaiśālī to Kuśīnagara: (1) the rivulet beside

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[1] The letters *Vesa* in l. 1 and *sā* in l. 2 are clear in the photograph, pl. XL, but indistinct in the impression, pl. XLIII C.

[2] The formula sounds like an exact quotation from the Pāli texts which abound in such passages.

[3] *Sumaṅgala-vilāsinī*, ed. T. W. Rhys Davids and J. Estlin Carpenter, P.T.S., I (London, 1886), pp. 309-11. The words *kaṇṇikaṁ yojetvā* have been translated above as 'pinnacled'; cf. Sanskrit *karṇaka* or *karṇika*, 'lug', 'round protuberance'. Elsewhere Buddhaghosha says that *harmya* is nothing else but a *prāsāda* with a *kūṭāgāra* on the top under the sky, *hammiyan ti upariākāsa-tala-patiṭṭhita-kūṭāgāro pāsādo yeva*, see the *Samanta-pāsādikā*, ed. J. Takakusu and Makoto Nagai (London, 1947), VI, p. 1215, implying the existence of pillars or poles as support for a *kūṭāgāra*. According to his description of Mahāvana-kūṭāgāra and his definition of *harmya*, the *kūṭāgāra* was a *harmya*, though its present representation does not show supporting pillars or posts.

[4] Beal, *op. cit.*, I, p. lii.

[5] This letter, lost in the crack of the stone, could have been *pa*.

[6] Beal, *op. cit.*, I, p. liii, and II, p. 69.



Amaravati: stele as excavated. *See p. 169*

To face p. 172



Amaravati: stele, first face. Scale of inches. *See p. 169*

To face pl. XLI

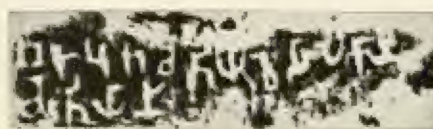


Amaravati: stele, second face. Scale of inches. *See p. 173*

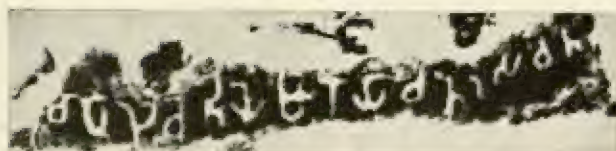
To face pl. XL



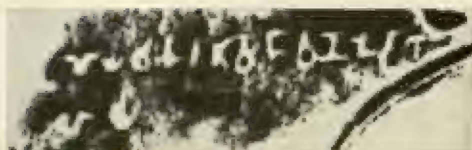
Amaravati: stele, third face. Scale of inches. See pp. 169 and 175



A



B



C



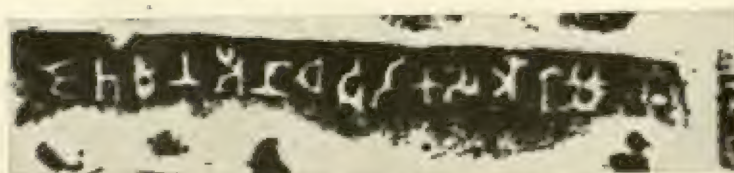
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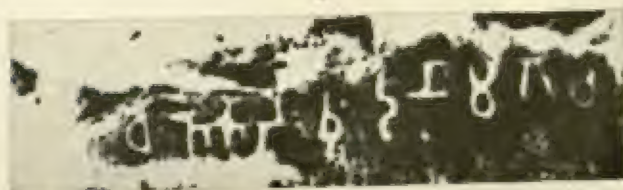
E



F



G



H



Amaravati: inscriptions on stele. *See pp. 171-75*

To face pl. XLII



B



A

Amaravati: yakshis (ht., A, 51 cm., and B, 67 cm.). *See p. 177*

which Ānanda prepared a seat for him under a tree, (2) the Kakutthā on the farther bank of which Chundaka spread out the golden robe, and (3) the Hiraṇyavatī. We have no hesitation in holding first identification as the correct one, for significant events, in the form of muddy water turning crystal-clear and a conversion, took place on the first rivulet. There Ānanda is specifically stated to have prepared a seat under a tree and to have fetched water in his bowl. The depiction of a tree with a seat below and the bowl on the river establish the identification beyond doubt. It may be noted that unlike two of the trees in the first scene, this tree has no railing around it, probably indicating that it had not the status of a *chaitya*.

(vii) *Sixth scene: parinirvāṇa*

Description.—A fragment of the last scene occurs at the top. Here we find a sad figure squatting with folded hands and part of the back of another figure. Above, near the extant top of the stele, is the following inscription in two lines:

Inscription E (pl. XLIII E).—(L. 1) [*sā*]*lavane*[1] *bhagavato* (L. 2) *parinivute*.

'The extinction[2] of the Lord in the *śāla*-grove.'

Comments.—Here, then, is the scene of the *parinirvāṇa*, including the conventional representation of one of mourners with his back turned.[3] It would have been interesting to have the other details of the scene, particularly to know if the death-scene was represented by a *stūpa*.[4]

C. Second face: Śrāvastī and Jetavana (pl. XLI)

(i) *First scene: Śrāvastī*

Description.—In the lowest part of the face, in the centre, are the pinnacled domes of three structures, the lower parts of which are not seen. The following inscription is recorded on the middle one:

Inscription F (pl. XLIII F).—*Sāvathi*.

'Śrāvastī.'

Comments.—The inscription, as it were, ushers the visitor into the city of Śrāvastī.

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[1] The vertical stroke below *na* seems to be adventitious.

[2] *Parinivute* may be taken as a verbal noun.

[3] Such a figure occurs in the *parinirvāṇa*-scenes at other places, e.g. Ajanta (Cave 26), Sarnath and Kuśinagara: *Ajanta*, pt. IV (Oxford University Press, 1955), pl. LXXX; Daya Ram Sahni, *Catalogue of the Museum of Archaeology at Sarnath* (Calcutta, 1914), pl. XIX; D. R. Patil, *Kuśinagara* (Delhi, 1957), pl. VIII. In all these instances there is beside the figure a tripod made of sticks (*tri-daṇḍa*) with a pot suspended from it. Sahni, *op. cit.*, p. 185, says that the figure must be identified with the recluse Subhadra, the last convert of Buddha, as would appear from the *tri-daṇḍa*; but the Tibetan tradition says that Subhadra died even before Buddha, W. Woodville Rockhill, *Life of the Buddha* (London, 1884), p. 138. No tripod is seen in our sculpture, and it is not known if one existed to the right of the figure, beyond which the stele is broken.

[4] At Bharhut and Sanchi simple *stūpas* have been taken as representations of the *parinirvāṇa*-scene, but in the absence of any typical Kuśinagara association, e.g. twin *śāla*-trees and mourners, such *stūpas* should be regarded as just sacred objects.

(ii) *Second scene: a structural complex*

DESCRIPTION.—The scene occurs in the left lower corner of the face. In the foreground is a pavilion having a curved roof with a pinnacle and surrounded at the base by a three-barred railing. The pavilion is approached by a flight of eleven steps flanked on either side by a balustrade made of uprights, eight in the front and ten in the back and three cross-bars. The isometric projection of the steps and balustrade is skilful. Behind the steps and partly hidden by it are five posts or pillars supporting a structure with a three-pinnacled vaulted roof[1] and a railing around. Though the structure is depicted somewhat obliquely, we have a frontal view of its *chaitya*-arched door.

COMMENTS.—The most significant part of the scene is the structure standing high up and connected with the ground by a stair-case. The edifices may represent the gateway-complex with a room over it, erected by prince Jeta at Jetavana at an enormous cost.[2] Or else they may represent a complex of houses at Śrāvastī.

(iii) *Third scene: another structural complex*

DESCRIPTION.—In the foreground of the third scene, to the right of the first one, occurs a tree which partly conceals the view of five posts or pillars supporting a vaulted structure with the usual railing. The structure is shown laterally, but its door is frontal.

COMMENTS.—This complex may be part of the monastic buildings of Jetavana; in fact, the presence of the tree at the entrance makes the identification probable, for we are told that in front of the gateway of Jetavana Ānanda planted a Bodhi-tree (Ānanda-Bodhi) with great ceremony and the king 'erected a gate-chamber of the seven precious things.'[3] Alternatively, it may be the depiction of another house of Śrāvastī with a tree in front.

(iv) *Fourth scene: purchase of Jetavana*

DESCRIPTION.—A low enclosure-wall, with a small gateway in the centre, separates Jetavana proper, the fourth scene, from the lower three ones. This scene depicts the familiar incident of Anāthapiṇḍika purchasing land at Jetavana in Śrāvastī from prince Jeta. As at Bharhut, we find here a tilted cart loaded with coins, mostly square but five or six round. A couchant bullock of the cart is seen at its fore near by. Over the cart is a mutilated pavilion with a railing, standing on pillars, also enclosed by a railing. The pillars are not parallel to each other and the pavilion is twisted; either it is intended to be shown as a dilapidated structure, or its delineation is an ill-attempted isometric projection. On the right are two persons engaged in spreading coins, which appear everywhere except in the chipped-off central part. Close by are two standing figures, one of which, seemingly directing the workmen, may be Anāthapiṇḍika. Towards the top, which is much

[1] This would be a *harmya* in Buddhaghosha's terminology, see above, p. 172, n. 3.

[2] *The Jātaka*, no. 229, Translation, ed. E.B. Cowell, P.T.S. (London, 1957), II, p. 152. Elsewhere, *Vinaya-Piṭaka*, ed. H. Oldenberg (London, 1880), II, *Chullavagga*, p. 159, we are told that Jeta erected a *koṭṭhaka* (Sanskrit *koshṭhaka*) on the land near the entrance of Jetavana which had been left uncovered by Anāthapiṇḍika's coins : *atha kho Jeto kumāro tasmiṁ okāse koṭṭhakam māpesi*; *Vinaya Texts*, III, Sacred Books of the East, XX (Oxford, 1885), p. 189.

[3] The *Jātaka*, no. 261, Translation, III, pp. 222-23, and no. 479, IV, p. 143. The planting of the sapling produced a miracle, as the tree immediately sprang to a height of fifty cubits and shot forth five great branches of fifty cubits each.

mutilated, is a flight of three steps, perhaps leading to another part or an upper storey of the monastery. The inscription below the cart and on the enclosure-wall runs as follows:

INSCRIPTION G (pl. XLIII G).—*Jetavana Anādhapiḍikasa ārāmo.*

'The *ārāma* of Anāthapiṇḍika in Jetavana'.

COMMENTS.—This representation of the Jetavana story is much more extensive than the well-known and oft-illustrated one on one of the Bharhut medallions. The structural complex in the first three scenes adds interest to the story and brings out the magnificence of the great monastery, which Anāthapiṇḍika lavishly provided with dwelling-rooms, retiring-rooms, store-rooms, etc.[1] Fa-Hien says that Jetavana had seven stages.[2]

D. THIRD FACE: DHĀNYAKAṬAKA (pl. XLII)

DESCRIPTION.—This face has suffered great damage and it is not possible to identify individual scenes on it. At the lower bottom, we find five tall uprights and a stair-case leading to a missing structure which the uprights must have supported. On the right are two short but massive pillars carrying a heavy vault, and further to the right is another structure with a *chaitya*-arch enclosed by a railing, square on plan. In the upper part is a twin structure, also with *chaitya*-arches and perhaps jointly enclosed by a railing, only part of which has survived. Further up is a pavilion with a round railing. On the right and above are waters, with streams flowing in two directions, within which are seen indistinct aquatic animals; some portion of the waters is shown enclosed by an embankment. A woman with a knotted mass of hair hanging on her back draws water from the river with a pitcher. No sculpture survives in the heavily-damaged uppermost part. There is an inscription written vertically to the left of the uppermost pavilion:

INSCRIPTION H (pl. LXIII H).—*Dhaṁñe*[3]*kaḍa Vaṁda-nāma goṭhi.*

'The *goshṭhī* called Vanda at Dhānyakaṭaka'.

COMMENTS.—This face no doubt represents a scene at Dhānyakaṭaka[4] (Amaravati), but owing to its fragmentary condition it is difficult to identify the scene. The waters are of the river Krishna, on the right bank of which Amaravati is situated. Even today the river takes a sharp turn near Amaravati: this may explain the dichotomic representation of the stream. The embankment may be that of the harbour that existed at the place. The word *goshṭhī*[5] may mean a committee or association, which may have had an important role in the construction or reconstruction of the *stūpa* and the establishments of which may be depicted in the buildings sculptured here.

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[1] *Vinaya-Piṭaka*, II, p. 159.

[2] Beal, *op. cit.*, I, p. xlv.

[3] The *e*-mark may be accidental.

[4] The word occurs in other inscriptions as Dhaṁñakaṭa, Dhaṁñakaṭaka, etc., and in Sanskrit Buddhist literature as Dhānyakaṭaka, e.g. *Ārya-Mañjuśrī-mūlakalpa*, ed. T. Gaṇapati Śāstrī, Trivandrum Sanskrit Series, no. LXX (Trivandrum, 1920), p. 88. Its modern representative is Dharanikota, half a kilometre to the north of the *stūpa*-site, on the bank of the Krishna, where there are extensive ruins of a fortified city.

[5] The word occurs in some inscriptions of Sanchi and Bhattiprolu, *Epigraphia Indica*, II (1894), pp. 99, 100, 102 and 327 and 329. Bühler is inclined to regard *goshṭhī* as 'a committee of trustees in charge of a temple or of a charitable foundation', *ibid.*, p. 92. Cf. *goṭṭhika* and *goshṭhika*, 'member of a *goshṭhī*', occurring respectively in a Mathura (second century) inscription and in a Pehowa (ninth century) inscription, *Indian Antiquary*, XXXIII (1904), pp. 104-05, and *Epigraphia Indica*, I (1892), pp. 184-90.

E. Fourth face

As stated above (p. 167), the fourth face of the stele has entirely disappeared.

4. OTHER REMARKS

From the foregoing it will be seen that the stele is important from more than one point of view: depiction of scenes not represented elsewhere;[1] interesting illustrations of architecture; and representations of the earliest phase of Amaravati art.

Artistically, the sculptures on the stele are affiliated to the early central Indian school in spite of the great distance separating Amaravati from the centres of that school; the typical Amaravati school was still to come. An *inter se* comparison of the sculptural art is difficult on account of the relative paucity of human and animal sculptures on our stele, but, on the whole, while the artist of the Sanchi gates shows greater assuredness in his carving, those of Bharhut (rail-stage) and Amaravati (as seen here) had, as it were, still to overcome their diffidence. The presence of labels on Bharhut rail and here, as if to explain Buddhist stories, till then not very popular, and their absence at Sanchi and Bodh-Gaya indicate, along with other factors, the chronological proximity of the stele to Bharhut (rail-stage) and its priority to Sanchi and Bodh-Gaya.

On the other hand, the depiction of edifices on the stele seems to mark an advancement over Bharhut, for whereas at the latter place the buildings are invariably shown either laterally or frontally, an attempted combination of both the views and even isometric projection are noticeable here. A date slightly earlier than the rail-stage of Bharhut and the gate-stage of Sanchi, perhaps late second century B.C., is thus indicated for the stele.

All this is not inconsistent with the evidence of the inscriptions. Palaeographically, the following points may be noted. The serif is entirely absent over all letters, as it is over those on the Bharhut *stūpa*-rail; its rudiments are seen on the Bharhut gate, and it further develops on the Sātakarṇi gate of Sanchi. Both the early forms of *a*, the one with open curved arms and the other an angle meeting the vertical in its centre, appear simultaneously, cf. Inscription G. The letter *ta* has the peculiar form of a vertical line with a curve issuing out of its centre, instead of the usual angle or arc hanging from a vertical stroke. The verticals of *pa* have a tendency of becoming equal to each other, as in the Bharhut and Sanchi gateways, but not in the Bharhut railing. The lower limbs of *ma* and *va* are invariably circular and not triangular (contrast the Sanchi gate), cf. Inscriptions B, C, G, and H. The *i*-sign over letters which do not end in a vertical right limb is a single vertical stroke, e.g. *thi* and *ṭhī* (Inscriptions F and H). *Ya* is usually of the notched variety.

Phonetically, the change of the surd into the respective sonant and of the surd aspirant into the respective sonant aspirant in *kuḍāgāra*, *logana*, *Anādha* and *Dhaṁñekaḍa* (Inscriptions C, D, G and H) requires mention. Grammatically, we may note the *e*-ending of the neutral noun in the nominative in *parinivute* (Inscription E). The verbal noun form in the word is also noteworthy.

[1] Such scenes are: Bahuputra-chaitya, Chāpāla-chaitya and the 'elephant's look' at Vaiśālī, the miracle of clear water and the *parinirvāṇa*—all on the first face and a scene of Dhānyakaṭaka on the third. There is no scene pertaining to Vaiśālī at Bharhut; only the offering of honey by monkeys appears at Sanchi.

Hardly anything in the script and language shows any provincial features. Artistically, as we have seen, the affinities of the sculptures with central India are manifest. Nevertheless, the stele was definitely a local product carved out of the local material and thus marks the beginnings of art at Amaravati in particular and south-east India in general. Once initiated, the *atelier* must have produced many a sculpture, of which not many early examples have survived; but opportunity is taken here of illustrating two available ones, each a *yakshī* (pl. XLIV), found in the same operation as the stele (above, p. 168) and of approximately the same date. In the course of next four centuries or so the Amaravati sculptor developed his own idiom and gave rise, during late Sātavāhana days, to what is known as the Amaravati school.[1]

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[1] Our thanks are due to Kumari K. Purna Iyer, Curator, Archaeological Museum, Amaravati, and Shri M. C. Joshi, Technical Assistant in the Headquarters Office, Archaeological Survey of India, for help in various directions.

ANCIENT RACES OF INDIA & PAKISTAN—A STUDY OF METHODS [1]

By D. K. Sen

CONTENTS

1. INTRODUCTION

THE AIM OF ARCHAEOLOGICAL EXCAVATIONS IS TO LOOK FOR, DESCRIBE AND IDENTIFY the past culture of a given area. After this primary work is done comes the job of postulating the origin and connexions of the culture on the basis of the objects prepared and used by the forgotten authors of the culture. Therefore, even after much

[1] Presidential Address to the Anthropology and Archaeology Section of the combined Fiftyfirst and Fiftysecond Sessions of the Indian Science Congress, Calcutta, 1964-65.

is known about the culture, there still remains the question of the people themselves, their characteristic physical features and their affiliations with past, contemporary and recent groups. Without such knowledge the account of any past culture would remain incomplete. Herein lies the importance of skeletal remains from archaeological sites. The work of interpreting such material is usually the responsibility of the physical anthropologist who is the specialist in the field. It is, therefore, quite logical that there is the scope of close co-operation between the archaeologist and physical anthropologist, and I am happy to note that a co-ordinated approach is quite evident in India, as it is anywhere else in the world today.

In the present paper I have made an attempt to review the work of anthropologists on the skeletal remains which have been excavated during the course of several years of painstaking work at different sites in India and Pakistan.

The object of this review is methodological in nature. I have tried to show that the interpretations hitherto made of the skeletal materials found in our sub-continent have been based on erroneous and outmoded concepts of race and that, therefore, these interpretations cannot be accepted as valid. I have next tried to show what would be achieved by a more rigorous application of a scientific concept, based on population-genetics. The application of this concept has brought in far-reaching repercussions in animal-taxonomy and is forcing the anthropologist to rethink on human taxonomy as well.

An anthropologist has to work under some limitations. He tries to trace inter-relationship among living races by taking numerous measurements on the bodies of individuals. From these measurements proportions between any two parts of the body are calculated into indices. The proportions of these indices in a population are expressed as percentages. In addition to the measurements of the body-parts and their proportions, the characteristics of various soft parts, such as colour and form of the hair, colour of the skin and pupils, shape and other characteristics of the eye, nose, lips, etc., are also studied. Recently, many of the physiological and biochemical properties of blood and other body-fluids have also been taken into account. But most of these are not applicable to human remains unearthed by the archaeologist. Moreover, such skeletal remains are more often than not broken or distorted out of shape. Even if the remains are perfect, the anthropologist has no means by which he can reconstruct the form of the soft parts or the nature of pigmentation of skin, eyes and hair. Naturally, under these circumstances, our inferences on the affinities of people represented by the skeletal remains will be very tentative and of limited value.

All interpretations are based on some concept or other. At a given time one concept may be popular, while another may be so at some other time. These changes in concept generally depend on the availability of further facts and the increase in our knowledge of the nature of things. For example, Linnaeus conceived species as static and eternal. But gradually a notion of mutability of species was taken for granted. Yet, Lamarck looked at the phenomenon in one way, and later on Darwin, on a very much larger amount of data, interpreted it in a different way. Still later, when genetics was rediscovered, it provided an even different way of looking at things and contributed far-reaching changes in Darwin's concept of the evolutionary mechanism. This necessity of the changes of concepts is true in every branch of science.

Physical anthropology deals primarily with the phenomena of evolution and differentiation of man as an animal-species. As such, the methods of classification and interpretation will be identical with those employed in animal-systematics or -taxonomy.

Central to these categories is the concept of species. Since man achieved the status of a species at a remote period of time, the question of the status of human skeletal remains found in India up to the present in the various archaeological fields does not arise. However, the correct infra-specific categorization of the material is vitally relevant to us. Any meaningful interpretation of the skeletal finds, therefore, must conform to the concepts pertaining to the infra-specific groupings as held by the modern authorities on the subject.

I shall begin the review by summarizing the published accounts on the skeletal remains excavated from various sites in the Indo-Pakistan sub-continent.

2. MATERIAL FROM DIFFERENT SITES

A. Sialkot and Bayana

The earliest reference to ancient skeletal remains in India is by Sir Arthur Keith who described two skulls referred to as 'Sialkot' (Panjab, Pakistan) and 'Bayana' (Rajasthan) respectively.[1] After examining the two skulls in detail, Keith came to the conclusion that both represented the Mediterranean race. Sewell and Guha, on the other hand, considered only one of them (Sialkot) as belonging to the Mediterranean stock, 'but the Bayana cranium has a lower vault and a higher bregma-index, which may indicate a certain degree of admixture of the Mediterranean with some other type.'[2]

B. Raigir

Hunt reported on six skulls from some cairns of uncertain age which he excavated at Raigir, Hyderabad.[3] He does not mention the racial affiliation of the individuals represented by the skulls.

C. Nal

The human bones, mostly fragmentary, found at Nal, Baluchistan, were handed over to Sewell and Guha of the Zoological Survey of India, who maintained that the bone-remains belonged to thirteen individuals, of which seven were probably adults.[4] Only one skull existed among the bones received by them, and the report is based on this single skull, which was not in good condition and had 'undergone slight deformation'. Even then, the most important measurements (maximum frontal diameter, bizygomatic breadth and intermalar breadth) on it were taken; these measurements were, therefore, more or less guesses. In spite of the defects in the skull, the authors had 'no hesitation' in assigning the individual whose skull was examined to the Mediterranean race. Incidentally, skulls of varying indices have been found at Kish; but among them only those with lower indices were selected and it was with them that the Nal skull, which had also a low

[1]Arthur Keith, 'Bayana and Sialkot', *Journal of the Anthropological Society of Bombay*, XI, no. 6 (1917), pp. 663-72.

[2]R. B. Seymour Sewell and B. S. Guha in H. Hargreaves, *Excavations in Baluchistan 1925, Sampur Mound, Mastung and Nāl*, Mem. Arch. Surv. Ind., no. 35 (1929), pp. 56-86.

[3]E. H. Hunt, 'Hyderabad cairn burials and their significance', *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, LIV (1924), pp. 140-56.

[4]R. B. Seymour Sewell and B. S. Guha in H. Hargreaves, *op. cit.*, pp. 56-86.

index, was compared, the other skulls from the same site being excluded presumable as irrelevant in the context.

D. Makran

Two skulls found in Makran, Baluchistan, were examined by Sewell and Guha. Their report shows that both the skulls were badly broken and distorted so that not many measurements could be taken.[1] No photographs accompany the report, and hence we cannot even guess the extent of the damage. However, although no measurement of the skull-cap could be taken, the authors felt that both skulls were dolichocephalic and at least Skull B appeared to have possessed a high vault 'very similar to that of the "Nal" cranium'. The authors further note: 'While agreeing with "Nal" skull in its general type Skull B would appear to show traces of mixed origin and in certain respects tends to approximate to the Caspian or Nordic Type of skull.'

E. Mohenjo-daro

The skeletal remains from Mohenjo-daro, West Pakistan, were excavated in more than one operation. The larger lot, found in the first operation, was published by Sewell and Guha.[2] From the remains of about twentysix individuals the authors selected fourteen as being in good condition.

Although these skulls were selected from among a larger number because of the relatively better state of their preservation, the authors draw our attention to the fact that these were 'not too greatly damaged to render reconstruction impossible, and from these to take measurements of a more or less reliable character and draw deductions from them. It must, however, be borne in mind that some of these skulls have undergone a certain amount of posthumous deformation owing to the pressure of the superincumbent earth, and this process has probably also been assisted by the deterioration of that part of the skull that lay below.'[3] Tables are provided showing these measurements which reveal a remarkable feature: the individual measurements of all the skulls, whether male, female or child, have been lumped together in order to calculate the average of the group—this being a method which is never applied by any anthropologist to living subjects and is contrary to the accepted practice.

The well-known thesis of the presence of multiple races in the population of Mohenjo-daro is based on the first group of fourteen skulls described by Sewell and Guha. They claim to have indentified four 'racial types' amongst eleven of the fourteen skulls of men, women and children. Thus, the first type isolated by them is Proto-Australoid. The particular characteristics, or the scoring criteria, are present in three skulls, all belonging to males. The second type allegedly belongs to the Mediterranean race, identifiable in skulls belonging to four females and two males. The characters of the Mongoloid race are said to be found on only one skull; and another single skull, this time that of a child, has been considered sufficient to establish the Alpine racial identity of its owner. Thus, the eleven individuals are very neatly pigeon-holed into one or the other great racial stocks, excepting the Negroid races.

[1] R. B. Seymour Sewell and B. S. Guha in Aurel Stein, *An Archaeological Tour in Gedrosia*, Mem. Arch. Surv. Ind., no. 43 (1931), pp. 191-200.

[2] R. B. Seymour Sewell and B. S. Guha in John Marshall, *Mohenjo-daro and the Indus Civilization* (London, 1931), II, pp. 599-648.

[3] *Ibid.*, pp. 606-07.

The second operation at Mohenjo-daro produced the remains of fifteen individuals, all presumably the victims of marauding raiders. Guha and Bose analysed only six of them.[1] Though the condition of the skulls was far from perfect, the authors tried to establish the 'racial affinities' of the people presented by the skeletal remains. In this effort, they took into consideration not only those skulls the measurements of which (mostly partial) are given in the tables, but also broken skull-pieces which appeared to suit their purpose. Thus, they assembled the skulls in two groups, A and B. After describing the two groups separately, they had no hesitation in affiliating the two persons represented by Group A skulls to the Proto-Australoid race and those represented by Group B skulls to the Mediterranean race. They also found evidence of admixture between the two races in one skull (M. 28), provisionally put in Group A. In their opinion, 'the presence of a high-pitched, narrow nose in M. 28, instead of the broad, flat nose of M. 11 [of the first operation] and other Mohenjo-daro A skulls [also of the same operation], may not improbably indicate, if anything, that both the races had been mixing their blood for a considerable time and individuals possessing different combinations of characters were not uncommon in that city'. In view of this statement, it is not immediately understandable why no skulls were classified as belonging to the intermediate classes among the fourteen skulls excavated in the first operation. In the analysis of those skulls, it had appeared that the fourteen persons belonged to four clear-cut races, and there was no sign of any intermixture among them. Finally, Guha and Bose were convinced that the structure of the forehead is indicative of intellect in the skulls of *Homo sapiens*. They remark: 'In Mohenjo-daro B skulls, on the other hand, the lack of great physical strength seems to have been compensated by the possession of a superior intellect as judged from the development of the frontal regions. If, therefore, brain rather than brawn be the real test of a ruler, the role of leadership must be assigned to the latter and not to the Mohenjo-daro A people.'[2] One can, however, hardly agree with the authors in this observation, which would appear to belong more to the art of phrenology than to scientific concepts of anthropology.

F. Chanhu-daro

A single skull was discovered at Chanhu-daro, West Pakistan, by Mackay in 1935-36. The skull described by Krogman and Sassaman,[3] was in a sufficiently good condition to permit a large number of measurements on the skull-cap and the face. The authors interpreted the characteristics on the skull as due to combination of the features of the Negroid and Proto-Mediterranean, with a suggestion of Eastern Asiatic (Mongoloid). This association of characters of several races in a single skull seems to have puzzled the authors, but they tried to solve the puzzle by postulating the hypothesis that originally the Negroid and the Proto-Mediterranean came from the same stock and that subsequently in Europe, 'the latter features were bred out to leave a purely Caucasic Mediterranean type'[4] and were geographically separated. The skull was thought to represent a final phase in the Harappa period, when the two types were recombined to simulate an earlier form. And all this speculation, it must be borne in mind, is based on

[1] B. S. Guha and P. C. Basu in E. J. H. Mackay, *Further Excavations at Mohenjo-daro* (Delhi, 1938), II, pp. 613-38.

[2] *Ibid.*, p. 632.

[3] W. M. Krogman and W. H. Sassaman in E. J. H. Mackay, *Chanhu-daro Excavations, 1935-36* (New Haven, 1943), pp. 252-64.

[4] *Ibid.*, p. 263.

a single skull. It is interesting further to note that the skull had enough features to rank it easily within the Mongoloid group. But the authors weighed this point and rejected the Mongoloid affinities and attributed these characters to individual variation. It may be recalled that Guha, with far less evidence in hand, had considered one of the fourteen skulls from Mohenjo-daro as Mongoloid.

G. Langhnaj

Four much-distorted and broken skulls excavated at Langhnaj, Gujarat, were described by Sankalia and Karve in 1949.[1] The skulls were so much out of shape that hardly any reliable measurements could be taken. In spite of this deficiency, the authors mainly depended on visual impressions and relegated them to represent a primitive *Homo sapiens* generally. What they understand by 'primitive' in this context is not specified. Moreover, on the basis of one skull, which had a 'slight prognathism' and showed a 'smooth, small, rounded forehead', they identified this 'primitive' element as Negroid. Later on, Guha re-examined the material and assigned a Proto-Australoid racial status to the individuals represented by it.[2]

H. The Dharmarājikā Stūpa, Taxila

The report on the remains from the Dharmarājikā Stūpa, Taxila, West Pakistan, was published in 1951 by Guha, Sarkar and Bose, all members of the Anthropological Survey of India.[3] Numerous measurements were taken of five skulls and of other bones. None of the five skulls was complete and all the measurements could not be taken in any. Also, judging from the published illustrations, all the skulls were more or less distorted. However, the authors maintained that each of the four skulls had a large brain, long head and face and prominent narrow nose. The fifth one was considered as belonging to an 'essential brachycephalic race' with a high cranial vault; as its facial part was extremely damaged, no opinion could be formed about the structure of the nose or the form of the face. Nevertheless, the authors were definite that the nose must have been long and prominent and the face of a short squarish type. After comparing the individual skulls with those from Mohenjo-daro and other places in and outside India, the authors came to the conclusion that there were two races recognizable among the skulls, neither of which showed much affiliation with the earlier skulls of Mohenjo-daro. They further stated: 'We have not been able to find their exact racial counterpart in the older races of the Indus valley, but from the somatic characters of some of the isolated tribes of the Hindu Kush Mountains, such as the Red Kaffirs... the Taxila monks appear to be closely allied to them...'.[4] The characteristics of the fifth skull were found to be so unique

[1] H. D. Sankalia and I. Karve, 'Early primitive microlithic culture and people of Gujarat', *American Anthropologist*, 51, no. 1 (1949), pp. 28-34.

[2] B. S. Guha and A. K. Mitra, 'Progress of Anthropology in India since 1938', *Mankind Quarterly*, 2, no. 2 (1961), pp. 107-19. [The material has been re-examined recently, Sophie Erhardt and Kenneth A. R. Kennedy, *Excavations at Langhnaj*, pt. iii, *The Human Remains* (Poona, 1965). The conclusion is: 'According to the interpretation from the available material the Langhnaj skeletons mainly indicate traits which are characteristic for Mediterranids and Veddids, but which could also include other races.'—Ed.]

[3] B. S. Guha, S. S. Sarkar and H. K. Bose in John Marshall, *Taxila* (Cambridge, 1951), I, pp. 296-314.

[4] *Ibid.*, p. 314.

that no parallel could be sought among either the ancient Indian skulls or the modern population in India. However, after much search in the available literature the authors could at length find similarities with skulls from the Tarim basin, which, according to them, happened to have been the supposed homeland of the White Huns, the destroyers of the city of Taxila. Therefore, they concluded the skull must have belonged to a White Hun who came to destroy the monasteries when one of them was slain there, and the bodies of the slayer and the slain rested there for thirteen hundred years for the spade of the modern archaeologist. It appears that in spite of the paucity of material, the anthropologists dared draw inferences which were beyond the capacity of the archaeologists.

I. Brahmagiri

Most of the skulls from Brahmagiri, Mysore, according to Sarkar, who examined them, were in a damaged condition and had undergone considerable distortion.[1] After a thorough examination of eight skulls in varying stages of deformity, Sarkar concluded that four of them belonged to the Scytho-Iranian stock, being somewhat similar in their cranial indices to those found at Sialk. He further states: 'This is also borne out by the very close similarity of the Brahmagiri skull B with that published by Vallois in his plate C, fig. 5.[2] Although the former skull belongs to a male and the latter to a female, the similarities are very much apparent in the cranial contour *excepting the frontal region*.' He considered the remaining skulls as belonging to an autochthonous race of Proto-Australoid stock.

J. Yelleswaram

Of the six skulls found at Yelleswaram, Andhra Pradesh, three belonged to males and three to females. All the male skulls had broad heads. The authors, Gupta and Dutta, were of the opinion that these male skulls, at least, showed similarities with those at Sialk and, therefore, presumably belonged to the same stock, viz. the Scytho-Iranian,[3] thus closely following the conclusion drawn by Sarkar on his Brahmagiri material.

K. Piklihal

Ayer described two skulls found associated with neolithic remains at Piklihal, Andhra Pradesh.[4] The skulls appeared to be of robust construction and were large-headed. An admirable description of the skulls and other associated bones was given by the author, but he refrained from drawing extensive racial affinities as is the practice in such cases; he, however, invited the reader's attention to the fact that such skulls were not rare among the modern Tamil-speaking population of the area and concluded that the people 'could be the ancestors of a major element of the present mixed so-called Dravidian inhabitants of the Deccan and Southern India.'[5]

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[1] S. S. Sarkar, 'Human skeletal remains from Brahmagiri', *Bulletin of the Department of Anthropology*, IX (1960), pp. 5-26.

[2] H. V. Vallois, *Les Ossements Humains de Sialk* (Paris, 1940), pp. 114-92.

[3] P. Gupta and P. C. Dutta, 'Human remains excavated from the megaliths at Yelleswaram', *Man in India*, 42, no. 1 (1962), pp. 19-34.

[4] A. A. Ayer in F. R. Allchin, *Piklihal Excavations* (Hyderabad, 1960), pp. 143-54.

[5] *Ibid.*, p. 154.

L. Nevasa

Sophie Erhardt reported on a skull and some other skeletal material from Nevasa, Madhya Pradesh.[1] The skull was described fully, and the author demonstrated a close similarity of the skull with those of the 'primitive' people of the jungle of Deccan.

M. Harappa

Gupta, Dutta and Basu have produced an excellent volume[2] containing much technical information on the human bones found mainly at two sites at Harappa, viz. R 37, considered to belong to the earlier (Harappa) culture, and Cemetery H, a cemetery-site, of a later date. Two smaller collections had also been made from Mound AB and Area G respectively. In all, over eighty skulls were subjected to a very rigorous description and measurement. The general conclusion may be given in the authors' own words: 'In sum, the popluation of mature Harappa culture (Cemetery R 37) was long-headed of which one type was tall, rugged and sturdily built, having pronounced eye-brow ridges, receding forehead, broad nose with depressed roots (Type A); and the other was gracile, comparatively shorter, finer and weaker Type (A_1). In a narrow trench at Area G some round-headed crania (Type B_1) were found huddled together with the long-headed gracile type (Type A_1). At Cemetery H Stratum II, skeletons similar to mature Harappan culture (Cemetery R 37) were discovered (Type A and Type A_1) in addition to a rather tall, large-and round-headed type (Type B_2). In Stratum I, besides the long-headed and round-headed peoples (Type A, Type A_1 and Type B_2), another rather medium statured small-and medium-headed, low-faced people (Type A_2; females only) was found.'[3]

N. Adichanallur

Partial reports on the Adichanallur skulls had been earlier published; but recently Chatterjee and Gupta made a comprehensive survey of the material.[4] Altogether thirteen skulls were considered, of which eight appeared to be male and the remaining ones female. The skulls were much broken and distorted, and most measurements were taken on reconstructed specimens. The authors were convinced that the present series of skulls had resemblances with both the Mediterranean and the Proto-Australoid as the Veddid types. Further, since skulls could not be neatly classified into either group but found place in both, they did not represent a homogeneous population and must be thought of as a group produced by a mixture of the two. According to them, the present-day Dravidian-speakers are the progenies of just this kind of mixture in the past. This conclusion, they maintained, is strengthened by the findings of the microlithic material in Gujarat, the skull at Bayana, and similar finds at Mohenjo-daro and Harappa, testifying to the presence of these two types in the ancient populations of India.

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[1] Sophie Erhardt in H. D. Sankalia and others, *From History to Pre-history at Nevasa (1954-56)* (Poona, 1960), pp. 506-22.

[2] P. Gupta, P. C. Dutta and A. Basu, *Human Skeletal Remains from Harappa*, Memoirs of the Anthropological Survey of India, no. 9 (Calcutta, 1962).

[3] *Ibid.*, p. 177.

[4] B. K. Chatterjee and P. Gupta, *Report on the Additanalur Skulls* (Calcutta, 1963).

O. Maski

Besides the published reports mentioned above, there are some others ready for publication in the custody of the Director of the Anthropological Survey of India, with whose permission they are being utilized here. In the first of these unpublished reports, S. S. Sarkar has considered about eighteen skulls from Maski, Mysore. All of them were badly broken and so much deformed that there was not a single one among the whole lot on which the usual set of measurements could be taken. The author, therefore, had to depend mainly on observational characters in order to trace the racial affinities of the people represented by the skulls but has managed to isolate three racial types from this very unsatisfactory material. These are, according to him (i) meso-brachy-cranic type (Scytho-Iranian?), (ii) a type 'represented by very long head, thick and heavy bones, longer cranial capacity, which, however, could not be measured in any skull...' This type appears to be similar to the al 'Ubaid type', and (iii) a type which seems to be similar to the autochthonous Australoid of this country.

P. Lothal

The unpublished report on Lothal, Gujarat, also by S. S. Sarkar, is based on nine skulls. All of them were very much broken and out of shape, so that all measurements and indices could be only approximate. The skulls have been grouped by the author at the outset into two groups—one having low indices and the other high indices. According to the author, there is a close similarity in certain features of both these groups of skulls with similar groups obtained by Vallois on the crania discovered at Sialk. Sarkar sees in it proof of the identity of types. In the case of Sialk, Vallois named these types Aryan and Armenoid respectively;[1] and by implication Sarkar also agrees to name his types at Lothal in the same manner. He, however, finds that while his Aryan type is pure, his Armenoid type is not so. It is necessary, therefore, argues Sarkar, that one must postulate a hybridization of the Armenoid with the Australoids, the latter represented by flat-nosed and shorter-faced primitive tribes of south India today. It appears that Sarkar's conclusion in identifying Aryan skeletal remains at Lothal in the late Harappa period fits in admirably with the hypothesis that the Harappa culture was destroyed by Aryan invasion towards the middle of the second millennium B.C. It may be mentioned that this is the first occasion in India when an anthropologist has identified prehistoric skulls that belonged to the Aryans; the term was long held to refer to a language-family and, therefore, not a suitable term for racial nomenclature.

Q. Ujjain

The last unpublished report is that prepared by P. Gupta, A. Basu and Anima Roy on the skeletal remains found at Ujjain, Madhya Pradesh. Altogether eighteen skulls have been considered for the report. The skulls were found to be in good condition and of fairly appropriate shape and also to be very homogeneous, so that the authors consider these as belonging to a single type comprising mainly of long-headed but somewhat broad-nosed individuals. The male and female skulls were strikingly similar in form. The mean values of the male skulls are similar to some modern Rajput and Punjabi skulls except in the form of the nose. The authors conclude that the population represented by the skulls may be classified with 'Indo-Aryan' in Risley's classification.

[1] Vallois, *op. cit.*

3. OBSERVATIONS ON THE PREVAILING METHOD

I have made an attempt in the preceding pages to summarize the salient points in the work of anthropologists on the racial affinities of the peoples of the past based on ancient skeletal material from India. I have particularly tried to bring out the sizes of the samples and the condition of the skull at each site so that the conclusions of the respective authors arrived at in each case can be judged. I may now examine the method followed in arriving at these conclusions and the conclusions themselves.

It will be noticed that almost all the authors referred to above have been bound by a single concept concerning the nature of ' race '. At the core of this concept lies the idea that the human species may be neatly sub-divided into a finite number of categories called ' races ' which are subject to clear-cut differentiation. These races are thought to occur in nature in a hierarchical sequence—a large agglomeration of people sub-divided into smaller units and each of the latter further sub-divided into a still smaller one. According to this traditional method, we need only a few broad characters to designate the large category; but as we come down the taxonomic ladder, we are supposed to use more and more characters in an assemblage in order to identify them.

These categories, whether large or small, are always traditionally named. But there is a considerable amount of controversy on the correct name that should be applied to each category. Thus, quite early, in 1776, Blumenback divided all mankind into five races, each circumscribed by geography: Caucasian, Mongolian, Ethiopian, American and Malay. He did not attempt to sub-divide these categories. Huxley, in 1870, classified world-population into the same five primary races: Negroid, Australoid, Mongoloid, Xanthocroid and Melanocroid. It is to be noticed here that the names do not designate any people of a particular geographic area, the suffix *oid* meaning ' like '. Each of them is again sub-divided. Thus, in Huxley's first race, Negroid, are included peoples both from Africa (Bushmen, Negro) and Melanesia (Papuan) which have been categorized as secondary races or modifications. Similarly, his second race, Australoid, includes the sub-races Australian, black races of the Deccan (Dravidian) and Ethiopian (Hamite). The third primary race, Mongoloid, includes five sub-races, Mongol, Polynesian, American, Eskimo and Malay. The fourth, Xanthocroid, based on skin-colour, consists of the white people of northern Europe, and the fifth and last, Melanocroid, includes the dark people of southern Europe and of Asia (Arabs, Afghan, Hindus, etc.). Thus, Huxley proposed five primary races with fourteen sub-races.

Next, Deniker sorted out six primary groups, but they are simply defined but not named.[1] Thus, his six groups are characterized as follows: (i) woolly hair and broad nose, (ii) curly or wavy hair, (iii) wavy brown or black hair and dark eyes, (iv) fair or straight hair and light eyes, (v) straight or wavy hair and black eyes, and (vi) straight hair. Included in these six primary groups are twentynine races and twentytwo sub-races, i.e. fiftyone in all.

The classification of man achieved much greater refinement at the hands of Hooton, who conceived three primary races: White, Negroid and Mongoloid.[2] Each race was conceived of as an original stock of man, of absolute purity. Eventually, each race was split up into several secondary sub-races, which, in turn, were divided sometimes into morphological types. These were all considered to be ' pure races '.

[1] J. Deniker, *The Races of Man* (London, 1900).
[2] E. A. Hooton, *Up from the Ape* (New York, 1956), pp. 423-661.

Besides the classifications mentioned above, many other authors have proposed the same in slightly different ways, emphasizing particular aspects of characters in which each was interested. But one attitude is common to all—that of looking at the phenomenon of race as synonymous with an abstract 'type'. We have seen that almost all the authors who interpreted the skeletal material in India have also apparently adhered to this conception. Thus, they have put the ancient skulls in one or the other types, like Negroid, Proto-Australoid, Australoid, Proto-Mediterranean, Mediterranean, Nordic, Alpine, Scytho-Iranian, and sometimes in categories believed to be intermediate between any two of these. In most cases such methods have produced results which have agreed very well with those of supposed archaeological findings from the respective site.

The procedure of 'typing'-practices has been very simple. Before analysing a sample of skulls (or living beings), the investigator is required to recall the types of the various 'races' which are likely to be involved in the formation of the sample. It must be understood that these races are all thought to be of utmost purity. The 'type'-characters are set arbitrarily, even though fairly long ago Coon stated that very few individuals conformed to the ideal type in the individuals of a given 'race'.[1] Stibbe gave the 'type' of Mongoloid skull the following characteristics: skull, often rather short, the maximum cranial length being rather under 190 mm., and the breadth of quite an average dimension, being from 140 mm. to 145 mm.; cephalic index, 80 and over, moderate brachycephaly; height, good, the average basibregmatic height being 140 mm. and the height-index being 77·5 to 80·0; face, tending to be broad, both in bizygomatic and bimaxillary diameters and without prognathism; eye-socket, as broad as it is high; and bridge of the nose, low and very wide between the orbits.[2] Now, this is an ideal 'type'. Nobody knows how the 'type'-characteristics were found. No mention is made of the variability of the traits, only arbitrary values being fixed. Obviously, these descriptions do not represent the characteristics of a sample, but those of a single skull, expressed as a sum total of a number of characters. Individuals carrying these traits together will certainly be very few as compared with the overwhelming majority of the population. Thus, this fact of variability is not taken into consideration. Stibbe likewise went on to give the ideal types of his 'Negroid' and the 'Australoid' races. His descriptions of these types are as unreal as are those of his Mongolian type. In spite of all these, almost all anthropologists working on the Indian material have been having these 'archetypes' before their mind, with the result that each skull has been taken singly and compared with one of the hypothetical racial types. If the comparison shows a closeness to a type, the skull has been regarded as belonging to that particular race. If, on the other hand, the resemblance is less exact, the skull has been relegated to a mixed group. It may very often happen that a single skull shows features that belong to two or more hypothetical types; in such cases, the skull has been immediately considered to have been the result of mixture of these races. Sometimes, the most likely 'racial types' have been considered in the skulls from a particular area, so that the conclusions could generally confirm a conventional story of invasion or migration put forward in history. Since the individual variability in physical characteristics is very great, it has not been difficult to find the type suitable in a particular situation from a collection of skeletal material.

When all the skulls have thus been put into the corresponding types, the latter are called 'elements'. If a skull appears to be intermediate between two or three types, it

[1] C. S. Coon, *The Races of Europe* (New York, 1939).

[2] E. P. Stibbe, *An Introduction to Physical Anthropology* (London, 1938).

is explained as a ' mixed type ' consisting of the corresponding ' elements '. One should notice that the size of the sample has been of no importance and the minimum unit of classification has been even one. Further, since no two skulls are absolutely similar to each other at any archaeological site, there will always be two or more elements detectable in any series of skulls; then the group has been assumed to be formed by admixture, but the elements are nevertheless thought to be quite discrete and identifiable. The ultimate resut of all this has been the splitting up of any series of skulls into the so-called 'elements', and their identification is thought to be the prime duty of a worker, because the ' type ' is supposed to be eternal and identifiable in a series of skulls wherever and in whichever historical period they are found.

This appears to have been a satisfactory and unquestionable methodology so far. The chief satisfaction has been that one could dispose of all skulls into a series by relegating them to one or the other type or to a mixed type as the case may be. There has been no loose end to be bothered about. Next, since the number of skulls has not been of much value, extensive reports have been written on even a single skull or even on fragments of a skull. Lastly, since there has been no question of any statistical check on the conclusions, which have always been in agreement with real or supposed archaeological findings; at least, they have not gone counter to the archaeological conclusions. In this way, the archaeologist is also satisfied. There is complete complacence on both sides; the anthropologist does not bother to question the method he uses, and the archaeologist does not take extra pains in recovering more skeletal remains than have been accidentally found. A skull here or a fragment of bone there has been thought to be sufficient to tell of the racial affinities of the ex-owner of the skull or bone.

4. CONCEPTS OF TAXONOMY

It seems to me that such a sense of security and complacence, a self-satisfaction of having achieved the final truth, is a sign of stagnation or decay in any branch of knowledge. And anthropology is no exception to this generalization. It is for this reason that I think that a re-examination of the concepts and methods underlying physical anthropology in India is called for. I shall concern myself with those related to the existing situation or the work on the study of ' racial affinities ' of ancient skeletal material, but it can equally be applied to anthropometrical studies on living subjects, for the methodology for both ought to be the same. The central concept of ' type ' automatically forms the chief subject of our discussion, for the kind of method and conclusions is based on it. As it is, I view the situation as a problem related to classification and taxonomy of living objects, specially those of animals, and consequently I shall discuss ' typology ' as a method of animal-classification and its scientific validity in the light of our present-day knowledge on the bases of such classification.

Life is so bewilderingly varied and comprises such an enormity of number that men from time immemorial have attempted to classify them in one way or another in order to create some degree of order out of the apparent chaos.

We all know that Linnaeus (1707-78) was the first who invented a system of classification which we still use and find very useful. His method of classification consisted of grouping animals by looking at the similarities and dissimilarities among them. This purely morphological method had been used by men before him and was used by all his contemporaries and many of his successors. To his credit goes the fact that for the first time he classified man among the animals, thus striking at quite a novel idea. Animals

in this system are classified from broader to narrower categories and the number of animals included in each category correspondingly decrease. The categories which he invented were Class, Order, Genus and Species. An animal was put in a particular category by the comparison of the common characters between those of the animal and those thought to be 'typical' of the group. Linnaeus and his contemporaries and many of his successors did not try to find out the meaning of these groupings and firmly believed that they had been created as such. The common characters became the hall-mark of a group of animals, the 'archetype'. No consideration was given to the naturally-occurring variation within groups of animals. The result was that if an animal did not conform to the accepted 'archetype', say, a species, a new species had to be created for it. The natural consequence was that a large number of species were soon recognized; they in turn had their own diagnostic characters. Linnaeus did not consider any infra-specific categories for his classifications and considered 'species' as the ultimate unit of classification.

This concept of static and non-variable species gave way to that of a variable species and the concept of changeability of a species. This break in the traditional thinking-process was due to the extensive field-work of both Darwin and Wallace, and the presentation of the theory of evolution by means of natural selection. These authors showed that naturally-occurring variability within a species was a fact of nature and provided the raw material for evolution. On the basis of this discovery scientists considered the Linnaean classification in a new way. They perceived that animals within a group were biologically related and were connected by descent with the next higher groups. It is, however, a paradox that the assignment of place to an animal in this classification continued in the same process as earlier, viz. by individual comparison with the 'type' by means of 'diagnostic characters'; in other words, the concept or 'archetype' was still strongly embedded in the mind of scientists and, through them, of common people. The concept has prevailed among quite a few workers even at present, as for example, the anthropologists to whom I have already referred earlier in connexion with the report on the skeletal material from different sites in India. The 'archetype' here is equated with the 'racial type' in its pristine purity.

However, towards the end of the last century a small group of bird-taxonomists recognized the geographic variations of a species and employed a trinomial system to designate such sub-specific categories. This resulted in a considerable reduction in the number of species, for many 'species' of birds were found to be nothing more than geographic variants and were relegated to sub-species. The concept of polytypic species gradually evolved from such a thinking-process. And in place of the habit of thinking of a species in terms of morphological types there grew up a new concept which was primarily biologic rather than morphologic. This can be seen from its definition given by Mayr as follows: 'Species are groups of actually or potentially inter-breeding natural populations, which are reproductively isolated from other such groups.'[1] On the other hand, a definition of species with the morphological characters basis would run somewhat as follows: 'A species is a group of individuals or populations with the same or similar morphological characters.'[2] It will be seen that most authors of the old school apply a somewhat similar definition as well for 'race' which must be an infra-specific category. Hooton's definition may be set up for an example: 'A race is a great division of mankind, the members of which, though individually varying, are characterized as a group by a

[1] E. Mayr, 'Speciation phenomena in birds', *American Nature*, 74 (1940), pp. 249-78.
[2] E. Mayr, *Systematics and the Origin of Species* (New York, 1947), p. 115.

certain combination of morphological and metrical features, principally non-adaptive, which have been derived from their common descent.'[1] One can see clearly that this definition of race is not materially different from that of species mentioned above (p. 190). In both, any similarity or dissimilarity in morphological characters has been taken as the basis for definition. This kind of definition does not differentiate between a higher-category species from a lower-category one, the sub-species of race, because more or less the same criteria are used for characterizing species, sub-species and even genera. This may result in considerable confusion in taxonomic thinking.

It follows from this discussion that any group defined by morphologic characteristics alone is invalid and is of not much use in scientific taxonomy, for we are not sure where to place a given group in the specific or in the sub-specific category.

5. RACE AND POPULATION

On the other hand, the definition of ' race ' given by geneticists of today would appear clearly to differentiate between the species and its sub-division, the sub-species. Sinnot, Dobzhansky and Dunn define ' race ' as follows: ' Races are populations that differ in the relative frequencies of gene alleles or of chromosome structure.'[2] This definition presupposes that the populations consist of intermarrying individuals and they are but reproductively isolated in a partial way from other such populations. We can at once see that by the criterion of reproductive isolation we arrive at a clear-cut distinction between the species and its sub-species: the former is reproductively a totally-closed unit, whereas the latter is only partially so. It means also that there is no intergradation of characters between two species due to gene flow; this is probably the rule between two races defined as above.

In addition to being convenient as a method of separating two graded taxonomic units, the genetic definitions of ' species ' and ' race ' permit us to approach closely the real biological phenomenon of evolution. The reason is that a population which is partially isolated from another is a real and vital entity of a species, since by the development of complete reproductive isolation such a population may develop into a new species, provided complete isolation is maintained, even if at some later time members of the new species come in contact with those of the old parent species. This process of splitting of a species to form new species is, of course, not the only way of speciation; nevertheless, it is certainly an important one.

Further, it is now well-known that micro-evolution or small changes in racial characters as we find among human groups must have resulted primarily from the action of selection, mutation or genetic drift. All these factors of evolution or differentiation act on a particular kind of human grouping only and not on any other kinds. This particular grouping is distinguished from other such groupings by the fact that the members constituting it intermarry among themselves. Groupings of this kind in biology are termed by geneticists as Mendelian populations, or simply as populations. In other words, the evolutionary agencies act on a population-unit, the members of which share a common gene-pool. If we are to study not only the static situation of population-differences in racial characters but also try to answer how the changes have come about, we must

[1] Hooton, *op. cit.*, p. 448.

[2] E. W. Sinnot, T. Dobzhanski and L. C. Dunn, *Principles of Genetics*, 5th ed. (New York, 1958), p. 279.

concentrate our attention on 'population' as a unit and then examine which factor or factors may have produced the recorded changes. In India, castes and sub-castes may result in the formation of definite populations. Elsewhere, class, religious sects, language, etc., lead to the formation of populations. If race has got any biological meaning, I agree with Sinnot, Dobzhansky and Dunn and prefer to call these populations as races. But such races would obviously be numerous in the present-day world, and naming each would be without much sense.

It would be apparent, however, that this designation of race as a population as used by geneticists is qualitatively different from that used traditionally by anthropologists and laymen alike. It is applied as a concept of the static Linnaean system to groups of individuals irrespective of whether these constitute Mendelian's population or not. The implication is that since these individuals are similar in regard to a particular characteristic, they obviously indicate a close common descent from a hypothetical ancestral group of individuals.

In other words, races are constructed by including individuals inhabiting any part of the world, who show certain degrees of similarities in *constellation of characters*, since the similarity is assumed to be due to the result of being very closely connected by descent. Combinations of characters are held to be inherited as a whole through succeeding generations and hence are thought to be stable. It can be shown that this assumption is wrong from the point of view of genetical knowledge available to us. Stability of a combination of traits is thought to be due either to the effect of pleiotropy or linkage. Bielicki has examined these assumptions and has shown mathematically that association of traits in a type is really spurious. He remarks: 'The frequencies of types in a given population are never in a satisfactory accordance with the Hardy-Weinberg Law, namely, the sum of the square roots of the frequencies of typologically "pure" individuals (i.e. those who are supposed to be homozygous) turns out to be much smaller than the theoretically expected value of 1·00.'[1] Such findings clearly weaken the assumption that pleiotropism produces the stability of 'type'-characters. As regards the assumption of linkage as the basis of the stability, numerous authors have shown that even closely-linked genes eventually become separated by crossing over in a Mendelian population so that the association is lost. Any apparent association is, therefore, not due to the phenomenon of linkage, which is usually investigated in linkages and not in populations.[2] Thus, we find that the concept of 'types' in a population is not supported by our present knowledge of population-genetics and that the 'types' are wholly arbitrary in the study of races.

On the other hand, in labelling populations as race, no such assumptions are made. It merely defines populations as breeding groups which differ significantly from another such group. As I have just said, such differences may arise due to several factors acting singly or together. The question of common ancestry or different ancestry for the population is a matter which needs proving in each case. Some authorities go so far as denying the existence of 'race' in the traditional sense.[3]

The above discussion on the relative value of the two kinds of definition has made it clear, I believe, that race as defined by the genetic method is superior to that made by

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[1] T. Bielicki, 'Some possibilities for estimating inter-population relationship on the basis of continuous traits', *Current Anthropology*, 3, no. 1 (1962), pp. 3-8.

[2] C. Stern, *Principles of Human Genetics* (California, 1950), p. 304.

[3] F. Livingstone, 'On the non-existence of human races', *Current Anthropology*, 3, no. 3 (1962), pp. 279-80.

the technique of morphology inasmuch as the former attempts to give a true picture of nature, while the latter is wholly artificial. If this is agreed upon, it follows that the human races, viz. Mediterranean, Nordic, Alpine, Armenoid, Proto-Australoid, etc., as defined by the morphologic method, are hardly of any value, since they do not represent any natural groupings but are merely the creation of imagination in the mind of individual taxonomists. The population is, on the other hand, the real entity which alone should be the aim of the study of an anthropologist.

One of the attributes of a population is that its boundary is, in most cases, very vague. This may annoy many taxonomists but cannot be helped. This vagueness is probably the attribute of life itself. However, the individuals who are the units of this grouping are very real. They are the men, women and children interrelated by the fact that they all share a common gene-pool, the relative proportions of the genes in the pool remaining fairly constant from generation to generation, provided certain conditions are fulfilled. In nature, no two individuals are genotypically equal to each other except of course in the case of identical or monozygotic twins. Each individual is unique. Genetically speaking, one may state that most individuals are heterozygous for most of the gene-loci. Moreover, most loci are represented by multiple alleles. All these lead to the existence of permanent variabilities for almost each conceivable character of the body. There is, therefore, no ' type ' in a population. Moreover, it follows from this that since races are populations, a single individual does not constitute a race. A race, therefore, must be described in statistical terms involving the variability found in the population. This is true not only of metrical characters but also of qualitative characters.

A population cannot also be fragmented at the same time keeping the attributes of the population in tact, so that while we find that there are different individuals in a population having one or the other of the four blood-groups, A, O, B, AB, nevertheless the individuals who are A cannot be set aside to form one race as against another consisting of B individuals. Such an effort is clearly unwarranted because then the parents and children might be said to belong to different races—which is quite absurd. If, as is always the case, in a population marriage is contracted irrespective of blood-groups, we shall have no biological justification to break up the population according to blood-groups. We must accept that the population is polymorphic for the different kinds of blood-groups. Furthermore, we must notice that none among these blood-groups is ' typical ' for the population even if the frequency of one of the groups may be the highest there. Thus, a person of group AB which has the least frequency in a population is not in any way less ' typical ' than the person of, say, group B, the frequency of which is usually higher than that of the AB group. As a matter of fact, the question of ' type ' is quite irrelevant here and is not compatible with the concept of population where the real entity is the group instead of the individual. Similarly, one would find variations in stature, head-shape, nose-shape, size of the skull, etc. Some people would be taller than others, some will have broader heads than others, and so on. But in each case, in a population no individual may be said to be typical, and it should be described with respect to the mean value of a particular character and all the variability found in the population for that particular character. A population is what it is—a group of intermarrying individuals—nothing else. It cannot be described by any single *a priori* criterion and no single person, whether real or hypothetical (compounded of all the mean values of metrical characters), represents it.

A type is usually created by the combination of several traits which may be qualitative or quantitative in nature. Obviously, the number of such combinations would depend upon the number of traits chosen arbitrarily. Now, after these combinations

are worked out, a few are chosen from these as being significant as racial elements and the rest rejected as being due to mixture or as otherwise unimportant. These remaining elements are then designated by racial names. This procedure is highly unscientific and certainly pre-Mendelian. It has been shown earlier (above, p. 192) that these combinations or types have no genetic validity. That these types are the result of chance-recombinations of separate traits in a population has been clearly shown by Hunt while analysing the Irish material of Hooton and Dupertius.[1] He has demonstrated by statistical calculations that the types designated by Hooton and Dupertius as races in the Irish population are mostly the result of chance-recombination of single traits. If two traits are very frequent in a population, there will be a considerable number of people having both traits together. Conversely, if two traits are less frequent in a population, comparatively few individuals will carry the traits together. A combination of traits, therefore, is not a fixed unit but is the result of chance-recombination of traits. In so far as they are not permanent units, they cannot be used as racial characters. On the other hand, a population should be characterized by the frequencies of individual characters. Since the morphological characters are present in a population as a continuous series, the distribution of each character necessarily takes the form of a normal curve if plotted on a graph-paper. The mean of this distribution with its standard deviation is the only meaningful constant for the purpose of description of the population. These two basic statistics must also be used for further analysis of the data and for comparison with other samples. In statistical thinking the value of a single specimen, living or dead, is useful in so far as it represents a sample. It is well-known that the value of a sample as representative of the universe increases as the size of the sample is increased, as can be judged from the smaller fluctuations of the standard error in larger samples as compared with smaller samples. It follows, therefore, that in describing a population a large sample is always preferable to a small one, and a sample consisting of only one or two specimens is quite useless to form any opinion on the universe from which the specimen or specimens have come.

6. EXAMINATION OF PREVIOUS CONCLUSIONS

A. Need for re-assessment

In view of the above discussion, we find that the conception of race and the method of its study have both undergone fundamental changes in recent times. We have no option, therefore, but to reject the conclusions based on the older concepts and methods. As we have seen earlier (above, p. 187), these conclusions are wholly confined to the question of 'racial affinities' of the skeletal remains. The skulls were ascribed to the various 'races', viz. 'Mongoloid', 'Proto-Australoid', 'Mediterranean', 'Alpine', and so on. We have shown that these categories do not exist. Therefore, these conclusions become meaningless. Not only that, the concept of 'population' produces far-reaching changes in our thinking-process. We no longer ask questions as to which 'race' a given sample of skull belongs, because the question put in this form has no meaning. We are interested, on the other hand, in knowing what were the probable physical characteristics of a given population as judged from the available samples. We enquire into the probability that the same population is still inhabiting the same locality. If there is any cultural evidence of mixture at a given site, we subject the skeletal sample to heterogeneity-tests to prove whether

[1] E. E. Hunt, Jr., 'Anthrometry, genetics and racial history', *American Anthropologist*, 61 (1959), pp. 64-83.

the people were also of a mixed type. We are no longer satisfied with our visual impression; we try to quantify the observation and examine the frequency of each trait.

For all these analyses we lay special emphasis on the size of the sample for reasons stated earlier (above, p. 194). And all the while we try to understand the basic problem of physical anthropology: what are the factors that cause human variation in time and space. In regard to this problem, theoretical concepts have gone far ahead of empirical data; once the typologic way of thinking is discarded, we shall each find before us almost a virgin field for enquiry, which has hardly been explored as yet.

After discarding the typologic method from racial analysis, we are now to see what result we obtain from subjecting the data to the well-known statistical methods. As an illustration of this method as applied to the prehistoric remains in India, I choose samples from three places in the north and west. They are the celebrated cities of Harappa, Mohenjo-daro and Lothal. These sites are dated fairly accurately and represent a homogenous Bronze Age culture.

B. Harappa

The material from Harappa is the largest sample yet available to us. As has been stated earlier (above, p. 185), it came from two cultural strata. A total of twentytwo skulls was derived from R 37, a cemetery of the mature form of the Harappa culture; of them fourteen belong to male and eight to female individuals. The later Cemetery H produced twentythree skulls, eight male and fifteen female.

In comparing two populations it is necessary to start with the hypothesis that no differences exist between them and then test this hypothesis. A hypothesis that differences do exist is not specific, and hence cannot form the basis of a test. The typologic method is of the latter category where it is taken for granted that *different* types exist in a population. Then there will be no other alternative but to look for the 'types' and eventually to find what is wanted. I have, therefore, assumed that no difference exists between the skulls from the two cultures at Harappa. The total number of skulls then comes to fortyfive, of which twentytwo belong to male and twentythree to female individuals.

Before proceeding to the analysis of the data, I must state the limits we have to recognize here on account of the smallness of the present sample. In data of this kind which are the results of chance-finds from the excavation of prehistoric sites, we have to work on the basis of two assumptions. The first is that the population comprising the entire Harappa city and its environs constituted a homogeneous population. Only with this assumption can we treat the sample as representing the entire population. In reality, the fact might be otherwise. There might have been large endogamous groups differing markedly in physical characteristics with one another. We do not know anything about it and we do not know further whether the sample belonged to one such population or to many. In assuming the homogeneity of the entire population we ignore this very likely situation.

The second assumption that we have to make is that the individuals in the sample have been chosen in a random manner from the population. Even if we assume that the population was homogeneous, a biased sample will result if only a selected part of the population may have been sampled. For example, if it so happens that only those skeletons survive the passage of time and the pressure of the superimposed deposit which are relatively stouter than those which did not survive the ravages of time, then stouter individuals will be found in greater numbers in our sample at the expense of leaner individuals, thereby introducing a certain amount of bias in the sample, which will no longer represent the total population. Although we do not know whether such was

actually the case in the present sample, it can be shown whether any given sample is a random one by a suitable statistical test. But for the test we require a large enough sample of over two hundred individuals; a small sample will not give any conclusive result for the test. We cannot, therefore, test it here, and this introduces a degree of uncertainly in the interpretation of the data. We thus find that the two assumptions we have made are important ones and together make the data considerably less reliable than if we had collected the sample from a living population where these assumptions are not necessary. But perhaps we cannot help it with archaeological material where very little is known about the population for most of the time. Nevertheless, we are to keep in mind these limitations while analysing or interpreting data.

With these preliminary observations, I now proceed to analyse the data. As I have said earlier, we have pooled the two samples from the two stratified cultures, namely R 37 and Cemetery H, on the hypothesis that these belong to the same population. One way of testing it is to show whether there is internal consistency between the males and females of the population by comparing their variances for each character. For this I have adopted the familiar critical ratio test[1], which is the ratio of the difference between the two corresponding constants to the standard error of the difference and it may be regarded as significant when its value is greater than 2. It is seen from Table I that the

TABLE I

CRITICAL RATIOS—HARAPPA MALE : FEMALE

No.	Characters	Male C.V. ±S.E.	Female C.V. ±S.E.	Critical ratio
1	Maximum cranial length	2·41±0·36	3·01±0·50	0·23
2	Maximum cranial breadth	3·99±0·63	4·33±0·62	0·38
3	Basion-bregma height	2·82±0·45	4·78±0·71	2·33
4	Minimum frontal breadth	3·35±0·54	4·61±0·62	1·53
5	Vertical portion height	2·74±0·48	4·43±0·65	2·09
6	Horizontal circumference	2·48±0·41	3·72±0·54	1·83
7	Nasion-prosthion line	6·00±0·93	7·55±1·11	1·07
8	Bizygomatic breadth..	4·43±0·99	3·47±0·68	0·80
9	Nasal height	5·83±0·88	7·72±1·00	1·42
10	Nasal breadth	8·51±1·31	7·32±0·96	0·73
11	Orbital breadth (left)	5·38±0·87	5·79±0·80	0·35
12	Orbital height (left)	8·04±1·27	7·28±1·05	0·46
13	Palatal length	7·05±1·18	7·90±1·22	0·15
14	Palatal breadth	9·85±1·60	6·46±1·14	1·73
15	Bigonial breadth	10·29±2·02	7·40±1·85	1·05
16	Bicondylar breadth	9·40±2·22	—	—
17	Mandibular breadth..	7·31±1·38	7·82±1·53	0·25
18	Length-breadth index	5·15±0·84	5·39±0·79	0·21
19	Breadth-height index	4·75±0·79	5·34±0·87	0·50
20	Superior facial index	9·24±2·07	5·52±1·23	1·54
21	Orbital index (left)	8·84±1·44	7·76±1·14	0·59
22	Nasal index	8·86±1·40	11·61±1·55	1·32
23	Palatal index	11·83±2·09	9·54±1·74	0·84
24	Mandibular index	14·67±3·46	—	—

*Values are statistically significant at 5% level as they are greater than or equal to 2.

[1] R. K. Mukherjee, C. R. Rao and J. C. Trevour, *The Ancient Inhabitants of Jebel Moya (Sudan)* (Cambridge, 1955), p. 60.

female series is somewhat more variable than the male, but the differences are significant in only two out of twentytwo characters, which are in basion-bregma height and vertical portion height, that is, mainly in the head-height. But in the breadth-height index the difference is not statistically significant. The values are also more or less of the same order. From this comparison we can be reasonably confident that the males and females might have been taken from the same population. In other words, the series can be taken to be reasonably homogeneous. A comparison of both the male and female series of Harappa has next been made with a known series the homogeneity of which is beyond dispute. Such a series is designated as Egyptian E from Giza.[1]

In the comparison between the Harappa male and Egyptian male (Table II), out of twentyone characters taken for comparison, the values of only four characters of the

TABLE II

CRITICAL RATIOS—HARAPPA MALE : EGYPTIAN MALE

No.	Characters	Harappa C.V. ± S.E.	Egyptian C.V. ± S.E.	Critical ratio
1	Maximum cranial length	2·41±0·36	3·09±0·07	1·85
2	Maximum cranial breadth	3·99±0·63	3·43±0·09	0·88
3	Basion-bregma height	2·82±0·45	3·75±0·09	2·03*
4	Minimum frontal breadth	3·35±0·54	4·28±0·10	1·69
5	Vertical portion height	2·74±0·48	3·63±0·06	1·84
6	Horizontal circumference	2·48±0·41	2·65±0·06	0·41
7	Nasion-prosthion line	6·00±0·93	—	—
8	Bizygomatic breadth	4·43±0·99	3·55±0·06	0·89
9	Nasal height	5·83±0·88	5·65±0·09	0·20
10	Nasal breadth	8·51±1·31	4·90±0·12	2·73*
11	Orbital breadth (left)	5·38±0·87	4·06±0·07	1·51
12	Orbital height (left)	8·04±1·27	5·56±0·14	1·94
13	Palatal length	7·05±1·18	6·70±0·11	0·30
14	Palatal breadth	9·85±1·60	6·78±0·18	1·91
15	Bigonial breadth	10·29±2·02	6·80±0·32	1·71
16	Bicondylar breadth	9·40±2·22	4·72±0·16	2·23*
17	Mandibular breadth..	7·31±1·38	4·74±0·24	1·84
18	Length-breadth index	5·15±0·84	3·57±0·06	1·88
19	Breadth-height index	4·75±0·79	4·14±0·07	0·77
20	Superior facial index	9·24±2·07	—	—
21	Orbital index (left)	8·84±1·44	5·96±0·10	2·00*
22	Nasal index	8·86±1·40	8·08±0·13	1·40
23	Palatal index	11·83±2·09	8·67±0·16	2·09*
24	Mandibular index	14·67±3·46	—	—

*Values are statistically significant at 5% level as it is greater than or equal to 2.

[1] K. Pearson and A. G. Davin, 'On the biometric constants of the human skull', *Biometrika*, 16 (1924), pp. 328-63; E. S. Martin, 'A study of an Egyptian series of mandibles, with special reference to mathematical methods of sexing', *ibid.*, 28 (1936), pp. 149-78.

Harappa series are found to be significantly larger than those of the Egyptian series and in one instance, that of basion-bregma height, it is smaller. In the rest of the characters, there is no significant difference in the coefficient of variability. We thus observe that the variability of the Egyptian series is very similar to that of the Harappa series in the majority of the characters.

Analysing in the same way we find that the majority of the characters of the Harappa female series (Table III) show substantial agreement with the Egyptian series of the corresponding sex.

TABLE III

CRITICAL RATIOS—HARAPPA FEMALE: EGYPTIAN FEMALE

No.	Characters	Harappa C.V. ±S.E.	Egyptian C.V. ±S.E.	Critical ratio
1	Maximum cranial length	3·81±0·50	2·66±0·07	2·28*
2	Maximum cranial breadth	4·33±0·62	3·34±0·10	1·58
3	Basion-bregma height	4·78±0·71	3·39±0·70	1·95
4	Minimum frontal breadth	4·61±0·62	4·11±0·12	0·79
5	Vertical porion height	4·43±0·65	3·32±0·07	1·70
6	Horizontal circumference	3·72±0·54	2·35±0·07	2·51*
7	Nasion-prosthion line	7·55±1·11	—	—
8	Bizygomatic breadth	3·47±0·68	3·62±0·08	0·22
9	Nasal height	7·72±1·00	5·31±0·10	2·41*
10	Nasal breadth	7·32±0·96	6·96±0·21	0·37
11	Orbital breadth (left)	5·79±0·80	3·97±0·08	2·26*
12	Orbital height (left)	7·28±1·05	5·62±0·11	1·58
13	Palatal length	7·30±1·22	6·26±0·13	0·85
14	Palatal breadth	6·46±1·14	6·83±0·15	0·32
15	Bigonial breadth	7·40±1·85	6·68±0·40	0·38
16	Bicondylar breadth	—	—	—
17	Mandibular breadth	7·82±1·53	4·32±0·18	2·27*
18	Length-breadth index	5·39±0·79	3·34±0·07	2·59*
19	Breadth-height index	5·34±0·87	3·88±0·08	1·67
20	Superior facial index	5·52±1·23	—	—
21	Orbital index (left)	7·76±1·14	5·47±0·11	2·01*
22	Nasal index	11·61±1·55	7·90±0·16	2·41*
23	Palatal index	9·54±1·74	8·40±0·19	0·65
24	Mandibular index	—	—	—

*Values are statistically significant at 5% level as they are greater than or equal to 2.

These comparisons will show that our sample may be considered as reasonably homogeneous, though less so than the Egyptian E sample. This would imply that our 'null' hypothesis has not been seriously disproved and the samples from the two cultures, R 37 and Cemetery H, can be held as not essentially different from each other.

The same conclusion of close identity between the populations represented in R 37 and in Cemetery H can clearly be drawn from a comparison of their mean values. Table IV compares the mean values of the male series, while Table V compares those of the female series. It is seen that the overwhelming majority of the mean values of the male

TABLE IV

COMPARATIVE TABLE OF HARAPPA R 37 (MALE) AND CEMETERY H (MALE)

No	Characters	R 37				Cemetery H			
		N	Mean ± S.E.	S.D.	C.V.	N	Mean ± S.E.	S.D.	C.V.
1	Maximum cranial length	13	187·54 ± 1·09	3·93	2·10	8	188·44 ± 2·05	5·79	3·07
2	Maximum cranial breadth	14	133·32 ± 0·83	3·11	2·33	6	141·33 ± 2·54	6·22	4·40
3	Basion-bregma height ..	12	133·79 ± 1·39	4·81	3·60	7	134·86 ± 0·59	1·57	1·16
4	Minimum frontal breadth	12	95·17 ± 0·84	2·89	3·04	6	96·08 ± 1·29	3·17	3·30
5	Horizontal circumference	11	520·00 ± 2·99	9·93	1·91	6	533·00 ± 4·97	12·17	2·28
6	Nasion-prosthion line ..	12	70·62 ± 1·20	4·15	5·88	7	68·93 ± 1·84	4·87	7·07
7	Nasal height ..	12	51·96 ± 0·90	3·11	5·99	8	51·75 ± 1·07	3·03	5·86
8	Nasal breadth ..	11	26·68 ± 0·74	2·45	9·18	8	25·88 ± 0·80	2·25	8·69
9	Orbital breadth (left) ..	11	42·36 ± 0·57	1·90	4·49	6	41·00 ± 1·05	2·57	6·27
10	Orbital height (left) ..	12	33·92 ± 0·70	2·43	7·16	6	33·58 ± 0·87	2·13	6·34
11	Palatal length ..	10	48·40 ± 1·20	3·78	7·81	7	46·14 ± 0·95	2·53	5·48
12	Palatal breadth ..	10	39·40 ± 1·01	3·20	8·12	8	39·31 ± 1·59	4·49	11·42

TABLE V

COMPARATIVE TABLE OF HARAPPA R 37 (FEMALE) AND CEMETERY H (FEMALE)

No.	Characters	R 37				Cemetery H			
		N	Mean ± S.E.	S.D.	C.V.	N	Mean ± S.E.	S.D.	C.V.
1	Maximum cranial length	14	179·68 ± 1·91	7·16	3·98	15	178·30 ± 1·73	6·68	3·75
2	Maximum cranial breadth	12	130·67 ± 1·50	5·20	3·98	12	131·92 ± 1·52	5·27	3·99
3	Basion-bregma height ..	10	127·60 ± 1·10	3·47	2·72	13	127·58 ± 2·13	7·70	6·04
4	Minimum frontal breadth	15	93·10 ± 0·80	3·08	3·31	12	92·21 ± 1·41	4·87	5·28
5	Horizontal circumference	12	502·42 ± 3·33	11·52	2·29	12	500·83 ± 6·84	23·68	4·73
6	Nasion-prosthion line ..	14	65·11 ± 0·94	3·52	5·41	9	61·56 ± 1·97	5·90	9·58
7	Nasal height ..	17	47·97 ± 0·70	2·89	6·02	13	46·04 ± 1·19	4·31	9·36
8	Nasal breadth ..	17	24·82 ± 0·41	1·70	6·85	12	24·58 ± 0·58	2·01	8·18
9	Orbital breadth (left) ..	14	40·75 ± 0·58	2·17	5·33	12	39·62 ± 0·71	2·45	6·18
10	Orbital height (left) ..	15	33·97 ± 0·53	2·06	6·06	9	32·44 ± 0·94	2·82	8·69
11	Palatal length ..	11	44·56 ± 0·95	3·17	7·11	7	43·79 ± 1·32	3·51	8·02
12	Palatal breadth ..	11	39·82 ± 0·26	0·87	2·18	5	35·20 ± 0·75	1·68	4·77

series are similar with the exception of head-breadth and circumference of the head, but since the latter dimension is influenced by the former, we have actually only one character out of eleven characters in which the mean values differ significantly. This is indeed a very small overall difference between the samples. Even this small overall difference is obliterated in the female series where all the mean values, without any exception, are similar. So the pooling together of the series of R 37 and of Cemetery H appears to be justified.

This, however, does not mean that the people represented by skeletons at Cemetery H could not have been different from those represented by the R 37 skeletons. The comparisons have merely shown that evidence is lacking for demonstrating such differences. It is probable that if the number of specimens are increased, i.e., if the sample-sizes become larger after more finds at the sites, evidences for such differences may be forthcoming. It is a pity that the size of the sample is small, since the two cultures show clear differences.

After we have shown the homogeneity of the sample, we can now utilize the mean values for describing the population (Tables VI and VII). Description is facilitated by

TABLE VI

STATISTICAL CONSTANTS OF POPULATION OF HARAPPA—ADULT MALE

No.	CHARACTERS	N	Mean ±S.E.	S.D. ±S.E.	C.V. ±S.E.
1	Maximum cranial length	22	188·00 ±0·97	4·53 ±0·68	2·41 ±0·36
2	Maximum cranial breadth	20	135·68 ±1·21	5·41 ±0·86	3·99 ±0·63
3	Basion-bregma height	20	136·50 ±0·86	3·85 ±0·61	2·82 ±0·45
4	Minimum frontal breadth	19	95·82 ±0·74	3·21 ±0·52	3·35 ±0·54
5	Vertical portion height	16	116·06 ±0·80	3·18 ±0·56	2·74 ±0·48
6	Horizontal circumference	18	525·89 ±3·08	13·06 ±2·18	2·48 ±0·41
7	Nasion-prosthion line	21	69·83 ±0·91	4·19 ±0·65	6·00 ±0·93
8	Bizygomatic breadth	10	133·15 ±1·87	5·90 ±1·32	4·43 ±0·99
9	Nasal height	22	52·16 ±0·65	3·04 ±0·46	5·83 ±0·88
10	Nasal breadth	21	26·31 ±0·49	2·24 ±0·35	8·51 ±1·31
11	Orbital breadth (left)	19	42·16 ±0·52	2·27 ±0·37	5·38 ±0·87
12	Orbital height (left)	20	34·32 ±0·62	2·76 ±0·56	8·04 ±1·27
13	Palatal length	18	47·39 ±0·79	3·34 ±0·56	7·05 ±1·18
14	Palatal breadth	19	39·71 ±0·90	3·91 ±0·63	9·85 ±1·60
15	Bigonial breadth	13	88·85 ±2·53	9·14 ±1·79	10·29 ±2·02
16	Bicondylar breadth	9	118·67 ±3·72	11·15 ±2·63	9·40 ±2·22
17	Mandibular length	14	82·32 ±1·61	6·02 ±1·14	7·31 ±1·38
18	Length-breadth index	19	72·60 ±0·86	3·74 ±0·61	5·15 ±0·84
19	Breadth-height index	18	98·35 ±1·10	4·67 ±0·78	4·75 ±0·79
20	Superior facial index	10	51·21 ±1·50	4·73 ±1·06	9·24 ±2·07
21	Orbital index (left)	19	81·67 ±1·66	7·22 ±1·17	8·84 ±1·44
22	Nasal index	20	50·25 ±1·00	4·45 ±0·70	8·86 ±1·40
23	Palatal index	16	82·42 ±2·44	9·75 ±1·72	11·83 ±2·09
24	Mandibular index	9	69·87 ±3·42	10·25 ±2·42	14·67 ±3·46

TABLE VII

STATISTICAL CONSTANTS OF POPULATION OF HARAPPA—ADULT FEMALE

No.	CHARACTERS	N	Mean ± S.E.	S.D. ± S.E.	C.V. ± S.E.
1	Maximum cranial length	29	178·97 ± 1·27	6·82 ± 0·90	3·81 ± 0·50
2	Maximum cranial breadth	24	131·29 ± 1·16	5·69 ± 0·82	4·33 ± 0·62
3	Basion-bregma height	23	127·59 ± 1·27	6·10 ± 0·90	4·78 ± 0·71
4	Minimum frontal breadth	28	92·36 ± 0·81	4·26 ± 0·57	4·61 ± 0·62
5	Vertical portion height	23	110·07 ± 1·02	4·88 ± 0·72	4·43 ± 0·65
6	Horizontal circumference	24	501·62 ± 3·80	18·64 ± 2·69	3·72 ± 0·54
7	Nasion-prosthion line	23	63·72 ± 1·00	4·81 ± 0·71	7·55 ± 1·11
8	Bizygomatic breadth	13	122·54 ± 1·18	4·25 ± 0·83	3·47 ± 0·68
9	Nasal height	30	47·13 ± 0·66	3·64 ± 0·47	7·72 ± 1·00
10	Nasal breadth	29	24·72 ± 0·34	1·81 ± 0·24	7·32 ± 0·96
11	Orbital breadth (left)	26	40·23 ± 0·46	2·33 ± 0·32	5·79 ± 0·80
12	Orbital height (left)	24	33·40 ± 0·50	2·43 ± 0·35	7·28 ± 1·05
13	Palatal length	18	44·25 ± 0·76	3·23 ± 0·54	7·30 ± 1·22
14	Palatal breadth	16	38·38 ± 0·62	2·48 ± 0·44	6·46 ± 1·14
15	Bigonial breadth	8	81·19 ± 2·12	6·01 ± 1·50	7·40 ± 1·85
16	Bicondylar breadth	4	—	—	—
17	Mandibular length	13	76·88 ± 1·66	6·01 ± 1·18	7·82 ± 1·53
18	Lenght-breadth index	23	74·17 ± 0·83	4·00 ± 0·59	5·39 ± 0·79
19	Breadth-height index	19	98·72 ± 1·21	5·27 ± 0·86	5·34 ± 0·87
20	Superior facial index	10	52·01 ± 0·91	2·87 ± 0·64	5·52 ± 1·23
21	Orbital index (left)	23	82·72 ± 1·34	6·42 ± 0·95	7·76 ± 1·14
22	Nasal index	28	52·97 ± 1·16	6·15 ± 0·82	11·61 ± 1·55
23	Palatal index	15	86·48 ± 2·13	8·25 ± 1·51	9·54 ± 1·74
24	Mandibular index	4	—	—	—

C.V. = coefficient of variation; S.D. = standard deviation; S.E. = standard error.

taking the indices into consideration because these refer to the shape of particular parts of the body.

In considering the mean values as describing a sample we must take into account their standard errors also. The latter give indications as to the extent to which the sample means approach the true means of the population. It is known that the smaller the standard error of the mean, the more accurately do we estimate the true mean of the population. It is held that the true mean lies in ninetyfive per cent of cases in an area covered by twice the standard error on either side of the true mean.

The range of the values of the two indices mentioned above and of those of many other indices have been arbitrarily broken up into categories and have been suitably named. This categorization of indices is very convenient for description of a sample or of an individual. The mere mention of the index-values may not always appear to register the significance in the mind of the readers.

According to our figures the cranial indices for both males (72·60±0·86) and females (74·17±0·83) indicate dolichocephaly or long-headedness, but females appear to be less so than the males. Now, let us consider how the standard error affects these values. It will be seen that for males the true mean may lie anywhere between 70·88 and 74·32, and for females between 72·51 and 75·83. While both values of males lie within the dolichocephal category, the higher value for the females finds itself in the mesocephal category. So that, for males we can be reasonably certain that the population might have been dolichocephalic but for the females we are not so sure: similar sample from the same population may show a mean denoting mesocephaly.

The breadth-height index of the skull-vault for females is 98·72±1·21. The means indicate acrocephaly or high-domed skulls for both males and females. However, judging from the standard errors for both sexes, the true means could as well be in the next lower metriocranial category. In this case, we are not certain whether the population had actually high-domed or medium-high-domed variety of skulls.

In the facial region, the shape of the upper face will be considered now. The index is calculated by the formula 100×upper facial height/bizygomatic breadth. As indicated by the means of the two sexes (male=51·21±1·50; female=52·01±0·91), we find that both of them have medium face, neither long nor particularly short. The two sexes do not differ in this respect. The standard error for males is fairly high, so that the true mean for the population fluctuates between the limits 48·21 and 54·21. Thus, the true mean might also have been in the euryn or short-faced category. We are not sure. As regards females, the true mean fluctuates between 50·19 and 53·83, both being in the medium category.

The orbital index (100×height of left orbit/breadth of the same) of both males and females have medium-high orbits (81·67±1·66; 82·72±1·34). The true means for both sexes, however, lie within this category, and the next higher one, hypsiconch or high face. Therefore, for descriptive purposes, the true nature of the sexes in this respect is uncertain, but probably the orbits were not low or chamaeconch.

We next consider the nasal index, 100×maximum breadth of nasal aperture/nasion to sub-nasion length; male=50·25±1·00, female=52·97±1·16). The mean nasal index of males belongs to the upper limit of the mesorrhine or medium-broad category, and that of females to the chamaerrhine category. But the standard error in males is such that it is difficult to gauge the nose-shape of the population; for it might be broad-nosed as well (48·25 to 52·25). Females, however, show that though the true mean fluctuates between 50·65 and 55·29, both these are in the broad-nosed category. Therefore, the females may probably be classified as such.

The palatal indices (100×breadth of the palate/length of the palate) for males (82·42±2·44) and for females (86·48±2·13) show that the former had mesostaphylin (medium-broad) palate, while females had brachystaphylin (broad) palate. But the standard errors for both sexes are so large that the true means for either sex fluctuate widely. Thus, for males the true means fluctuate between 77·54 (narrow) and 87·30 (broad), while for females the fluctuation is between 82·22 (medium-broad) and 90·74 (broad). In this case, it is evident that it would be futile to say anything about the shape of the palate of the population.

From this very brief analysis of a few selected traits which are generally employed by the anthropologists for racial analysis, we no doubt obtain some idea of the sample represented by the skeletons found at Harappa. Thus, judging from the above means we find that the Harappans were long-headed and high-domed groups, the sexes not

differing markedly in these characteristics. They had medium-high faces and orbits of medium dimensions. While the population was markedly broad-nosed as a whole, the females of the series show relatively more flattened noses than their male counterparts. The palates of both sexes were broad generally, with the females registering a somewhat broader aspects than those of males.

Consideration of the values of variance forces us to admit that the population was reasonably homogeneous, and females formed part of the population. Furthermore, since there is no marked heterogeneity in the material at our disposal, the hypothesis that the group is formed by more than one discrete population must be held as not proved. Under the circumstances, to postulate several racial stocks or elements going into the formation of the Harappans should be considered as presumptuous and the result perhaps of wishful thinking, and not as a statement based on scientific reasonings.

C. Mohenjo-daro

Let us now take up the skeletal remains from Mohenjo-daro, a Harappan site situated some 500 km. south of Harappa down the river Indus. It will be recalled that Colonel Seymour Sewell and Dr. B. S. Guha, who worked on these bones, postulated that the population constituted of four racial stocks (above, p. 181). This evidently means that the population was highly heterogeneous. Now, when we come to examine the evidence of such statement, we observe that it was based on thirteen skulls, five of them belonging to females and seven to males, all adults, and the remaining one to that of a child, which we should discard in our analysis following the usual practice in racial studies. The skulls were in varying degrees of distortion and intactness. Consequently, the authors reported the cephalic indices of only five male and three female skulls. It is to be noted that they considered the values on two male and two female skulls as of doubtful nature. In the fitness of things we should have rejected those skulls, but the number of skulls being so small, we are forced to take them tentatively.

The sample-size is so small that we can in no way study the heterogeneity of the group. The mean cephalic indices come to 72·60 for the males and 65·66 for three female skulls. Evidently, the population had dolichocephalic or long heads.

In regard to the nasal index denoting nose-shape, we have the mean values 51·71 for four male and 46·93 for five female skulls. These values relegate the skulls to roughly the medium-nosed category, although the female skulls register somewhat narrower noses than their male counterparts.

The mean height-width index of the face *minus* the jaw of three skulls is 51·7, denoting a face neither too narrow nor too short. The value of one female skull is given as 54·46, also of the same type as those of the males.

The orbital index of five male and five female skulls respectively is 86·84 and 88·38, indicating high orbits for both the sexes.

The authors give the estimated heights of four male and three female skeletons; the means come respectively to 175·5 cm. and 144·3 cm. These estimations are made according to Pearson's method. From these figures we find that the mean male-height indicates tall individuals, but the sex-difference appears to be substantial. Individual skeletons in both sexes also vary widely from each other. This result may probably be due to the smallness of the sample and also to the fact that coefficient of correlation calculated on European skeletons have been applied to this material, in which the coefficient values are not known.

D. Lothal

Finally, we consider the skeletons excavated from Lothal, a third Harappan site, this time in Gujarat. Here the skulls and other bones are so distorted and broken, and with so many missing parts, that we shall confine ourselves to the cephalic and nasal indices.

Dr. S. S. Sarkar identified all the skulls (above, p. 186) as belonging to the males. There are altogether nine skulls upon which cephalic indices should be calculated. One of them belongs to a child, which is discarded for our analysis. Of the remaining male skulls, almost all bear query-marks. However, the mean cephalic index of the group comes to 79·68. We observe that when compared with the males from Harappa and Mohenjo-daro it is a definitely higher value bordering on broad-headedness.

As regards the shape of the nose, Sarkar gives the following values, all of doubtful nature, of three skulls; 57·47, 44·00 and 59·00. The mean of these values comes to 53·52, a value which decidedly puts the skulls in the chamaerrhine or broad-nosed clan.

According to Sarkar's calculation, the mean stature of five individuals is 172·1 cm., indicating a fairly tall group.

E. General observations

The above descriptions of the three skeletal populations lead us to form some opinion of the characteristics of the respective populations. Two generalizations seem to be legitimate in this context. The first is that the populations at Harappa, Mohenjo-daro and Lothal possessed rather broad noses. And the second is that the population at Lothal had, relative to those at the two other sites, broader heads. The proper interpretation of these facts depends primarily upon the basic data, i.e., the measurements made on the skulls. From the reports we find that most measurements were made on distorted and broken skulls. This is the most important contributory factor of the wide variations that we notice in the skulls of the small samples at our disposal. For example, the cephalic indices of the seven skulls from Lothal vary between 66·51 and 91·86, that is, between extreme dolichocephaly and extreme brachycephaly. This degree of variation is not to be expected in any sample of a very small size and must be due to the distortion of the skulls.

Meanwhile, the most concrete fact that has emerged from our studies of the Harappan skeletal material is that at each of these sites the population was homogeneous with regard, at least, to head-shape, nose-shape and stature. This would mean that whatever their original composition might have been, the populations at these sites belonged each to a single biological group and not recognizable as belonging to several races with distinctive characteristics. Secondly, this population was broad-nosed or chamaerrhine, tall and long-headed in Panjab and Sind and with somewhat rounder heads in Gujarat.

We must separate the issue of the origin of the Harappan peoples from the question of the origin of the Harappa culture. We should also take into account the physical variation of the people of Harappa culture in the north and in the south as in Gujarat. As we have seen earlier, the skulls in the north were dolichocephalic, whereas they were meso-brachycephalic in the south. If we assume that the culture was brought to India from elsewhere physically by a horde of people, we must necessarily conclude that the broad-headed among them selectively moved to the south while the long-headed people chose to stay in the north. This is palpably absurd because migration never occurs on the basis

of head-shape. Alternatively, we have to assume two centres of the origin of the people both having identical cultures, one carried by people with broad heads, and the other by those with long heads. As yet archaeologists have not pointed out such twin sources. From the point of view of an anthropologist, it seems to me that at least an equally plausible hypothesis to put forward is that the populations in India during the Harappan times descended from earlier populations in the same regions. This would explain the difference in the head-shape between the northern and the southern branches, being due to regional variations as at present.

The question of autochthonous origin of the culture in north-west India must be taken into account. The recent discovery at Kalibangan where the Archaeological Survey of India has found ' a full-blooded Harappa settlement overlaying the remains of an earlier culture ' is significant in this context. This earlier culture is under investigation, and Ghosh believes that it may prove to have contributed to the origins and make-up of the Harappa culture.[1] Under the circumstances, skeletal finds at Kalibangan would be of immense interest in the tracing of physical development in India in the mid-second century B.C. I would like to insist that if we have to make a hypothesis at this stage on the origin of the Harappan populations, it is safer to assume that they originated in the local soil rather than to bring them from thousands of miles away.

7. CONCLUSION

Ancient skeletons almost wholly come from the digging of archaeologists, and I take this opportunity of appealing to them not to equate a skull with a potsherd. A single potsherd may point out the direction of migration of a culture and establish theories of cultural connexion with people inhabiting far-away places. This is because the designs of the colour-combinations on a single potsherd is the reflection of an idea, of a norm, which a people consciously tries to maintain for generations. Each potsherd is a type, only slightly deviating, if it does, from the norm. A single skull, on the other hand, or a piece of jaw-bone, or of any other bone, exists on a different level. Here there is no idea, no archetype, and since the inherent variation in life is enormous, a single skull is of no meaning to us as a sample representing a population. The need of an anthropologist, therefore, is a large sample. Admittedly, this is a tall order, requiring considerable effort; but the result, I believe, will amply justify such an effort in the long run.

[*Received on the 2nd November, 1965.—Ed.*]

[1] A. Ghosh, ' Archaeology in India ', *Expedition*, VI, no. 3 (1964), p. 16.

TECHNICAL SECTION

ON EXCAVATING A HOUSE THAT WAS NEVER BUILT !

By B. B. Lal

TO EXCAVATE A HOUSE THAT ONCE EXISTED IS A THING COMMON ENOUGH IN archaeological operations, for the excavator often comes across the remains of walls which give a fairly good idea of the house-plan. Sometimes, even when the actual walls are not available—having been robbed away for the sake of the material of which they had been constructed—the excavator is able to make out the former existence of such walls from the 'robbers' trenches'; and by following up these trenches he is able to plot the 'ghost' of the once-existing house. But to excavate a house that had been planned but was never built is indeed a new experience, at least to the present writer.

In 1961, while excavating at Sardargarh, District Ganganagar, Rajasthan, the writer came across in one of the trenches (north-eastern quadrant of Square ZA 1 in fig. 1) an approximately $\frac{1}{2}$-m. wide and $\frac{1}{4}$-m. deep 'channel', cut into earlier occupational layers and itself containing alternating bands of sand and silt and occasional potsherds. The 'channel' having been traced across the quadrant—a length of about 2 m.—the north-western quadrant of the Square was taken up for investigation. There also the 'channel' was traced, having the same contents and following the same alignment. The total length thus became a little over 4 m. At this stage some of the colleagues present at the site surmised that the 'channel' might be a drain; but the absence in the 'channel' of sullage-material (usually met with in drains) and the near-verticality combined with a sort of sharpness of its walls (unusual to walls of unlined drains) made the writer doubt the possibility of the 'channel' having functioned as a drain.

The obvious course then was to extend the operation to the remaining quadrants of the same (ZA 1) Square and to other adjacent Squares, as necessary. While the south-eastern quadrant of the Square did not yield any evidence, the south-western quadrant threw some interesting light on the problem. It revealed another 'channel', of the same width and depth as the former but aligned altogether differently—at more or less a right angle to the former. The supporters of the 'drain' theory were at first taken aback, but they soon tried to regain their stand by arguing that the newly-discovered channel might be another drain joining the former. However, as the contents and the condition of the side-walls in this case also were the same as in the previous one, the writer's initial objection to the drain-theory still stood there. If anything, the objection became all the stronger, for rarely does one see a *kuchcha* (i.e. cut into the soil and not lined with brick or stone) drain turning or joining another sharply at a right angle. On the other hand, this very feature, namely the meeting at a right angle of the two 'channels', made the writer think that the channels might, instead, represent two adjacent arms of the foundation-trench of a house.

The matter was pursued further, into Square A 1. Here the 'cross-channel' was further traced, which increased its overall length to nearly 8 m. However, more

SARDARGARH (RAJASTHAN) 1961

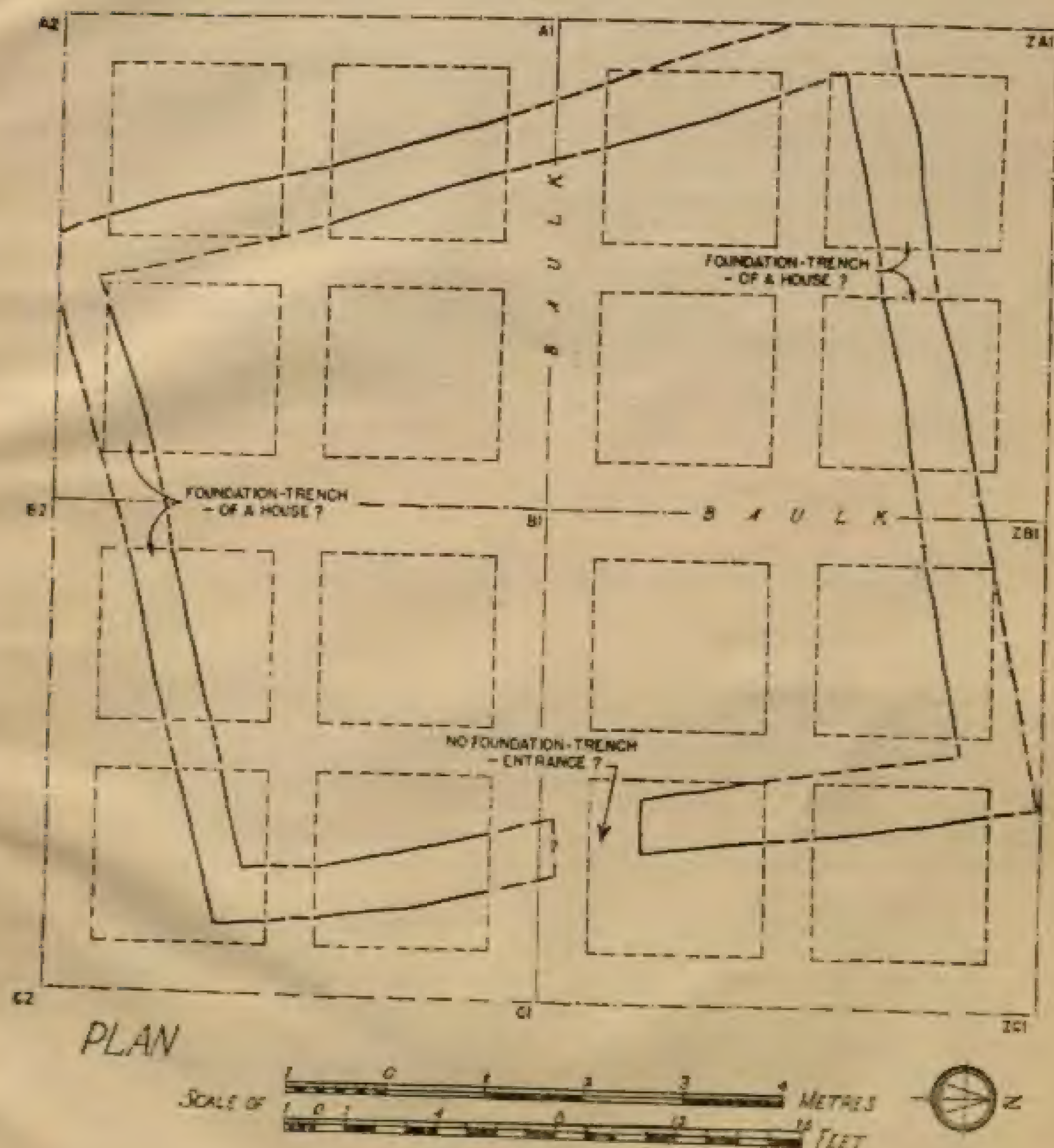


Fig. 1

important than the foregoing was the discovery of still another 'cross-channel', again at more or less a right angle to the one just described. Such a behaviour of the 'channels' redoubled the writer's conviction in his working hypothesis, according to which the 'cross-channels' would represent the various arms of the foundation-trench of a house.

Pursuing this new alignment into Square B 1, the writer got not only another 4 m. of the last-mentioned 'cross-channel' but also yet another 'cross-channel'. In the latter case, however, there were two significant features. In the first place, unlike in other Squares where the supposed 'crossings' had fallen under the baulks and could not be duly ascertained, in Square B 1 it was clearly determined that there was no 'crossing' as such, but just a turn (fig. 1; pl. XLV B), which clearly set at naught the possibility of a 'criss-cross' arrangement of drains. (On pl. XLV B may be seen not only the sharp outlines of the turn, but also the sand-and-silt deposits of the 'channel', which stand in marked contrast to the earlier occupational deposits containing even a pot *in situ*.) Secondly, the direction of this turn virtually closed in the 'channels', which, again, made the drain-theory still less plausible.

The extension of the operations into Square ZB 1 brought to light not merely the fourth corner (though under the baulks in fig. 1 and on pl. XLV A, yet easily inferable on the analogy of the south-eastern corner in Square B 1), but also a 'square' end of the 'channel' (cf. fig. 1, and pls. XLV A and XLVI B). Giving a closer view of this end, pl. XLVI B also shows how, by chance, a pot, occurring in the preceding occupational deposits, just escaped destruction.

The plan, as finally retrieved, left little doubt that the 'channels' were not drains, laid out in a criss-cross fashion, but the arms of a foundation-trench. The four arms produced the plan of a house having an overall dimension of about $8\frac{1}{2}\times7\frac{1}{2}$ m.[1] The thickness of the walls, as conditioned by the width of the foundation-trench, could not have been more than half a metre. The house had an entrance on the eastern side, the exact width of which, however, could not be determined as one of the ends of the foundation-trench fell under the baulk. All the same, there could be little doubt that there was, under the baulk between Squares B 1 and ZB 1, the end of the arm of the foundation-trench proceeding from south-east to north-west in Square B 1. For, there was no continuity of this arm of the trench in Square ZB 1. (It had originally been planned to resume the work at the site during the following season when all the baulks were to be removed and the complete outline of the foundation-trench recovered, but owing to certain inevitable reasons the work was not continued.)

The excavation threw valuable light also on the probable date of the proposed building of the house. A look at pl. XLVI A would show that the foundation-trench was cut into layer 3 and sealed by layer 2. The former contained the Painted Grey Ware (first-half of the first millennium B.C.), and the latter Kushan pottery (early centuries A.D.). The latter pottery was also recovered from the foundation-trench. The obvious inference, therefore, would be that it was in the Kushan period that somebody wanted to build the house. The foundation-trench was dug, leaving out the space for the entrance on the east. However, as chance would have it, the house was never constructed. In the exposed foundation-trench, therefore, accumulated layers of silt and sand in wet and hot weathers. (There is too much of sand about in the area, and observations show that such

[1] The dimension seems to be too big for a single room. One thus expected to find within this area further foundation-trenches, for walls of individual rooms. The scheme of building the house itself was perhaps soon abandoned, and as such the other trenches were never dug.



A. *Sardargarh: general view of the plan of the foundation-trench. In the foreground may be seen the end of the right arm of the foundation-trench, indicating an entrance.* *See p. 208*



B. *Sardargarh: close-up of the turn of the foundation-trench, looking west (cf. south-eastern quadrant of square B 1 in fig. 1). In the foundation-trench may be seen bands of sand and silt. Scale: each division 5 cm.* *See p. 208*



A. *Sardargarh: close-up of a section across the foundation trench. At the bottom may be seen Kushan pottery, and above it bands of sand and silt. Scale: each division 5 cm.* *See p. 208*



B. *Sardargarh: close-up of the square end of the foundation-trench (cf. pl. XLVA and south-eastern quadrant of Square ZB 1 in fig. 1). Scale: each division 5 cm.* *See p. 208*

a shallow trench—about ½-m. deep—can easily get filled up in a couple of years at the most.) The rains must have brought into the trench a few of the Kushan sherds that had been lying about on the adjoining surface.

So here are the plan and date of a house that was never built!

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